Gray's School and Field Botany

REVISED EDITION

BRIAR CLIFF COLLEGE
SIOUX CITY, IOWA

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GRAY'S

SCHOOL AND FIELD BOOK

OF

BOTANY

CONSISTING OF "LESSONS IN BOTANY" AND
"FIELD, FOREST, AND GARDEN BOTANY"
BOUND IN ONE VOLUME

REVISED EDITION

SAINT FRANCIS CONVENT
DUBUQUE, IOWA

PUBLISHERS' PREFACE

TO

GRAY'S SCHOOL AND FIELD BOOK OF BOTANY.

THIS work consists of the "LESSONS IN BOTANY" and the "FIELD, FOREST, AND GARDEN BOTANY," bound together in *one complete volume*, forming a most popular and comprehensive SCHOOL BOTANY, adapted to beginners and advanced classes, to Agricultural Colleges and Schools, as well as to all other grades in which the science is taught. It is also adapted for use as a handbook to assist in analyzing plants and flowers in field study of botany either by classes or individuals.

The book is intended to furnish Botanical Classes and beginners with an easier introduction to the Plants of this country, and a much more comprehensive work, than the MANUAL.

Beginning with the *first principles*, it progresses by easy stages until the student who is at all diligent is enabled to master the intricacies of the science.

It is a *Grammar* and *Dictionary* of Botany, and comprises the common Herbs, Shrubs, and Trees of the Southern as well as the Northern and Middle States, including the commonly cultivated as well as the native species in *fields, gardens, pleasure grounds*, or *house culture*, and even the *conservatory plants* ordinarily met with.

GRAY'S LESSONS IN BOTANY

REVISED EDITION

BRIAR CLIFF COLLEGE
SIOUX CITY, IOWA

THE

ELEMENTS OF BOTANY

FOR BEGINNERS AND FOR SCHOOLS

By ASA GRAY

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GRAY'S BOTANICAL SERIES

Gray's How Plants Grow
Gray's How Plants Behave
*Gray's Lessons in Botany
Gray's Field, Forest, and Garden Botany
(Flora only)
*Gray's School and Field Book of Botany
(Lessons and Flora)
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*Gray's Lessons and Manual of Botany
Gray's Botanical Text-Book
I. Gray's Structural Botany
II. Goodale's Physiological Botany
Coulter's Manual of Botany of the Rocky Mountains
Gray and Coulter's Text-Book of Western Botany

EDITIONS OF 1901

*Leavitt's Outlines of Botany
(Based on Gray's Lessons)
*Leavitt's Outlines of Botany with Flora
(Outlines and Gray's Field, Forest, and Garden Botany)
*Leavitt's Outlines and Gray's Manual

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PREFACE.

This volume takes the place of the author's Lessons in Botany and Vegetable Physiology, published over a quarter of a century ago. It is constructed on the same lines, and is a kind of new and much revised edition of that successful work. While in some respects more extended, it is also more concise and terse than its predecessor. This should the better fit it for its purpose now that competent teachers are common. They may in many cases develop paragraphs into lectures, and fully illustrate points which are barely, but it is hoped clearly, stated. Indeed, even for those without a teacher, it may be that a condensed is better than a diffuse exposition.

The book is adapted to the higher schools, "How Plants Grow and Behave" being the "Botany for Young People and Common Schools." It is intended to ground beginners in Structural Botany and the principles of vegetable life, mainly as concerns Flowering or Phanerogamous plants, with which botanical instruction should always begin; also to be a companion and interpreter to the Manuals and Floras by which the student threads his flowery way to a clear knowledge of the surrounding vegetable creation. Such a book, like a grammar, must needs abound in technical words, which thus arrayed may seem formidable; nevertheless, if rightly apprehended, this treatise should teach that the study of botany is not the learning of names and terms, but the acquisition of knowledge and ideas. No effort should be made to commit technical terms to memory. Any term used in describing a plant or explaining its structure can be looked up when it is wanted, and that should suffice. On the other hand, plans of

structure, types, adaptations, and modifications, once understood, are not readily forgotten; and they give meaning and interest to the technical terms used in explaining them.

In these "Elements" naturally no mention has been made of certain terms and names which recent cryptogamically-minded botanists, with lack of proportion and just perspective, are endeavoring to introduce into phanerogamous botany, and which are not needed nor appropriate, even in more advanced works, for the adequate recognition of the ascertained analogies and homologies.

As this volume will be the grammar and dictionary to more than one or two Manuals, Floras, etc., the particular directions for procedure which were given in the "First Lessons" are now relegated to those works themselves, which in their new editions will provide the requisite explanations. On the other hand, in view of such extended use, the Glossary at the end of this book has been considerably enlarged. It will be found to include not merely the common terms of botanical description but also many which are unusual or obsolete; yet any of them may now and then be encountered. Moreover, no small number of the Latin and Greek words which form the whole or part of the commoner specific names are added to this Glossary, some in an Anglicized, others in their Latin form. This may be helpful to students with small Latin and less Greek, in catching the meaning of a botanical name or term.

The illustrations in this volume are largely increased in number. They are mostly from the hand of Isaac Sprague.

It happens that the title chosen for this book is that of the author's earliest publication, in the year 1836, of which copies are rarely seen; so that no inconvenience is likely to arise from the present use of the name.

ASA GRAY

CAMBRIDGE, MASSACHUSETTS,
March, 1887.

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ELEMENTS OF BOTANY.

Section I. INTRODUCTORY.

1. Botany is the name of the science of the vegetable kingdom in general; that is, of plants.

2. Plants may be studied as to their kinds and relationships. This study is Systematic Botany. An enumeration of the kinds of vegetables, as far as known, classified according to their various degrees of resemblance or difference, constitutes a general *System of plants*. A similar account of the vegetables of any particular country or district is called a *Flora*.

3. Plants may be studied as to their structure and parts. This is Structural Botany, or Organography. The study of the organs or parts of plants in regard to the different forms and different uses which the same kind of organ may assume, — the comparison, for instance, of a flower-leaf or a bud-scale with a common leaf, — is Vegetable Morphology, or Morphological Botany. The study of the minute structure of the parts, to learn by the microscope what they themselves are formed of, is Vegetable Anatomy, or Histology; in other words, it is Microscopical Structural Botany. The study of the actions of plants or of their parts, of the ways in which a plant lives, grows, and acts, is the province of Physiological Botany, or Vegetable Physiology.

4. This book is to teach the outlines of Structural Botany and of the simpler parts of the physiology of plants, that it may be known how plants are constructed and adapted to their surroundings, and how they live, move, propagate, and have their being in an existence no less real, although more simple, than that of the animal creation which they support. Particularly, this book is to teach the principles of the structure and relationships of plants, the nature and names of their parts and their modifications, and so to prepare for the study of Systematic Botany; in which the learner may ascertain the name and the place in the system of any or all of the ordinary plants within reach, whether wild or cultivated. And in ascertaining the name of any plant, the student, if rightly taught, will come to know all about its general or particular structure, rank, and relationship to other plants.

5 The vegetable kingdom is so vast and various, and the difference is so wide between ordinary trees, shrubs, and herbs on the one hand, and mosses, moulds, and such like on the other, that it is hardly possible to frame an intelligible account of plants as a whole without contradictions or misstatements, or endless and troublesome qualifications. If we say that plants come from seeds, bear flowers, and have roots, stems, and leaves, this is not true of the lower orders. It is best for the beginner, therefore, to treat of the higher orders of plants by themselves, without particular reference to the lower.

6. Let it be understood, accordingly, that there is a higher and a lower series of plants; namely: —

PHANEROGAMOUS PLANTS, which come from seed and bear *flowers*, essentially stamens and pistils, through the co-operation of which seed is produced. For shortness, these are commonly called PHANEROGAMS, or *Phænogams*, or by the equivalent English name of FLOWERING PLANTS.[1]

CRYPTOGAMOUS PLANTS, or CRYPTOGAMS, come from minute bodies, which answer to seeds, but are of much simpler structure, and such plants have not stamens and pistils. Therefore they are called in English FLOWERLESS PLANTS. Such are Ferns, Mosses, Algæ or Seaweeds, Fungi, etc. These sorts have each to be studied separately, for each class or order has a plan of its own.

7. But Phanerogamous, or Flowering, Plants are all constructed on one plan, or *type*. That is, taking almost any ordinary herb, shrub, or tree for a pattern, it will exemplify the whole series: the parts of one plant answer to the parts of any other, with only certain differences in particulars. And the occupation and the delight of the scientific botanist is in tracing out this common plan, in detecting the likenesses under all the diversities, and in noting the meaning of these manifold diversities. So the attentive study of any one plant, from its growth out of the seed to the flowering and fruiting state and the production of seed like to that from which the plant grew, would not only give a correct general idea of the structure, growth, and characteristics of Flowering Plants in general, but also serve as a pattern or standard of comparison. Some plants will serve this purpose of a pattern much better than others. A proper pattern will be one that is perfect in the sense of having all the principal parts of a phanerogamous plant, and simple and regular in having these parts free from complications or disguises. The common Flax-plant may very well serve this purpose. Being an annual, it has the advantage of being easily raised and carried in a short time through its circle of existence, from seedling to fruit and seed.

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[1] The name is sometimes *Phanerogamous*, sometimes *Phænogamous* (*Phanerogams*, or *Phænogams*), terms of the same meaning etymologically; the former of preferable form, but the latter shorter. The meaning of such terms is explained in the Glossary

SECTION II. FLAX AS A PATTERN PLANT.

8. Growth from the Seed. Phanerogamous plants grow from seed, and their flowers are destined to the production of seeds. A seed has a rudimentary plant ready formed in it, — sometimes with the two most essential parts, i. e. stem and leaf, plainly discernible; sometimes with no obvious distinction of organs until germination begins. This incipient plant is called an EMBRYO.

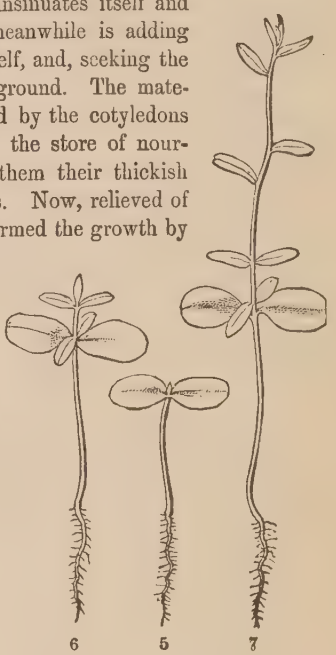
9. In this section the Flax-plant is taken as a specimen, or type, and the development and history of common plants in general is illustrated by it. In flax-seed the embryo nearly fills the coats, but not quite. There is a small deposit of nourishment between the seed-coat and the embryo: this may for the present be left out of the account. This embryo consists of a pair of leaves, pressed together face to face, and attached to an extremely short stem. (Fig. 2–4.) In this rudimentary condition the real nature of the parts is not at once apparent; but when the seed grows they promptly reveal their character, — as the accompanying figures (Fig. 5–7) show.

1 2 3 4

10. Before the nature of these parts in the seed was altogether understood, technical names were given to them, which are still in use. These initial leaves were named COTYLEDONS. The initial stem on which they stand was called the RADICLE. That was because it gives rise to the first root; but, as it is really the beginning of the stem, and because it is the stem that produces the root and not the root that produces the stem, it is better to name it the CAULICLE. Recently it has been named *Hypocotyle;* which signifies something below the cotyledons, without pronouncing what its nature is.

FIG. 1. Pod of Flax. 2. Section lengthwise, showing two of the seeds; one whole, the other cut half away, bringing contained embryo into view. 3. Similar section of a flax-seed more magnified and divided flatwise; turned round, so that the stem-end (caulicle) of the embryo is below: the whole broad upper part is the inner face of one of the cotyledons; the minute nick at its base is the plumule. 4. Similar section through a seed turned edgewise, showing the thickness of the cotyledons, and the minute plumule between them. i. e. the minute bud on the upper end of the caulicle.

11. On committing these seeds to moist and warm soil they soon sprout, i. e. *germinate*. The very short stem-part of the embryo is the first to grow. It lengthens, protrudes its root-end; this turns downward, if not already pointing in that direction, and while it is lengthening a root forms at its point and grows downward into the ground. This root continues to grow on from its lower end, and thus insinuates itself and penetrates into the soil. The stem meanwhile is adding to its length throughout; it erects itself, and, seeking the light, brings the seed up out of the ground. The materials for this growth have been supplied by the cotyledons or seed-leaves, still in the seed: it was the store of nourishing material they held which gave them their thickish shape, so unlike that of ordinary leaves. Now, relieved of a part of this store of food, which has formed the growth by which they have been raised into the air and light, they appropriate the remainder to their own growth. In enlarging they open and throw off the seed-husk; they expand, diverge into a horizontal position, turn green, and thus become a pair of evident leaves, the first foliage of a tiny plant. This seedling, although diminutive and most simple, possesses and puts into use, all the ORGANS of VEGETATION, namely, root, stem, and leaves, each in its proper element, — the root in the soil, the stem rising out of it, the leaves in the light and open air. It now draws in moisture and some food-materials from the soil by its root, conveys this through the stem into the leaves, where these materials, along with other crude food which these imbibe from the air, are assimilated into vegetable matter, i. e. into the material for further growth.



12. **Further Growth** soon proceeds to the formation of new parts, — downward in the production of more root, or of branches of the main root, upward in the development of more stem and leaves. That from which a stem with its leaves is continued, or a new stem (i. e. branch) originated, is a BUD. The most conspicuous and familiar buds are those of most shrubs and trees, bearing buds formed in summer or autumn, to grow the following

FIG. 5. Early Flax seedling; stem (caulicle), root at lower end, expanded seed-leaves (cotyledons) at the other: minute bud (plumule) between these. 6. Same later; the bud developed into second pair of leaves, with hardly any stem-part below them; then into a third pair of leaves, raised on a short joint of stem; and a fifth leaf also showing. 7. Same still older, with more leaves developed, but these singly (one after another), and with joints of stem between them.

spring. But every such point for new growth may equally bear the name. When there is such a bud between the cotyledons in the seed or seedling it is called the PLUMULE. This is conspicuous enough in a bean (Fig. 29.), where the young leaf of the new growth looks like a little plume, whence the name, *plumule*. In flax-seed this is very minute indeed, but is discernible with a magnifier, and in the seedling it shows itself distinctly (Fig. 5, 6, 7)

13. As it grows it shapes itself into a second pair of leaves, which of course rests on a second joint of stem, although in this instance that remains too short to be well seen. Upon its summit appears the third pair of leaves, soon to be raised upon its proper joint of stem; the next leaf is single, and is carried up still further upon its supporting joint of stem; and so on. The root, meanwhile, continues to grow underground, not joint after joint, but continuously, from its lower end; and commonly it before long multiplies itself by branches, which lengthen by the same continuous growth. But stems are built up by a succession of leaf-bearing growths, such as are strongly marked in a reed or corn-stalk, and less so in such an herb as Flax. The word "joint" is ambiguous: it may mean either the portion between successive leaves, or their junction, where the leaves are attached. For precision, therefore, the place where the leaf or leaves are borne is called a NODE, and the naked interval between two nodes, an INTERNODE.

8

14. In this way a simple stem with its garniture of leaves is developed from the seed. But besides this direct continuation, buds may form and develop into lateral stems, that is, *into branches*, from any node. The proper origin of branches is from the AXIL of a leaf, i. e. the angle between leaf and stem on the upper side; [illegible] again branch, so building up the herb, shrub, or tree. But [illegible] without long delay in an annual like Flax, instead of this continuance of mere vegetation, reproduction is prepared for by

FIG. 8. Upper part of Flax-plant in blossom.

15. **Blossoming.** In Flax the flowers make their appearance at the end of the stem and branches. The growth, which otherwise might continue them farther or indefinitely, now takes the form of blossom, and is subservient to the production of seed.

16. **The Flower** of Flax consists, first, of five small green leaves, crowded into a circle: this is the CALYX, or flower-cup. When its separate leaves are referred to they are called SEPALS, a name which distinguishes them from foliage-leaves on the one hand, and from petals on the other. Then come five delicate and *colored* leaves (in the Flax, blue), which form the COROLLA, and its leaves are PETALS; then a circle of organs, in

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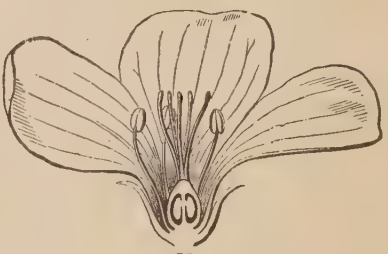

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which all likeness to leaves is lost, consisting of slender stalks with a knob at summit, the STAMENS; and lastly, in the centre, the rounded body, which becomes a pod, surmounted by five slender or stalk-like bodies. This, all together, is the PISTIL. The lower part of it, which is to contain the seeds, is the OVARY; the slender organs surmounting this are STYLES; the knob borne on the apex of each style is a STIGMA. Going back to the stamens, these are of two parts, viz. the stalk, called FILAMENT, and the body it bears, the ANTHER. Anthers are filled with POLLEN, a powdery substance made up of minute grains.

17. The pollen shed from the anthers when they open falls upon or is conveyed to the stigmas; then the pollen-grains set up a kind of growth (to be discerned only by aid of a good microscope), which penetrates the style: this growth takes the form of a thread more delicate than the finest spider's web, and reaches the bodies which are to become seeds (OVULES they are called until this change occurs); these, touched by this influence, are incited to a new growth within, which becomes an embryo. So, as the ovary ripens into the seed-pod or capsule (Fig. 1, etc.) containing seeds, each seed enclosing a rudimentary new plantlet, the round of this vegetable existence is completed.

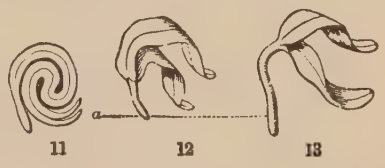
FIG. 9. Flax-flowers about natural size. 10. Section of a flower moderately enlarged, showing a part of the petals and stamens, all five styles, and a section of ovary with two ovules or rudimentary seeds.

Section III. MORPHOLOGY OF SEEDLINGS.

18. Having obtained a general idea of the growth and parts of a phanerogamous plant from the common Flax of the field, the seeds and seedlings of other familiar plants may be taken up, and their variations from the assumed pattern examined.

19. Germinating Maples are excellent to begin with, the parts being so much larger than in Flax that a common magnifying glass, although convenient, is hardly necessary. The only disadvantage is that fresh seeds are not readily to be had at all seasons.

20. The seeds of Sugar Maple ripen at the end of summer, and germinate in early spring. The embryo fills the whole seed, in which it is nicely packed; and the nature of the parts is obvious even before growth begins. There is a stemlet (caulicle) and a pair of long and narrow seed-leaves (cotyledons), doubled up and coiled, green even in the seed, and in germination at once unfolding into the first pair of foliage-leaves, though of shape quite unlike those that follow.



11 12 13

21. Red Maple seeds are ripe and ready to germinate at the beginning of summer, and are therefore more convenient for study. The cotyledons are crumpled in the seed, and not easy to straighten out until they unfold themselves in germination. The story of their development into the seedling is told by the accompanying Fig. 14–20; and that of Sugar Maple is closely similar. No plumule or bud appears in the embryo of these two Maples until the seed-leaves have nearly attained their full growth and are acting as foliage-leaves, and until a root is formed below. There is no great store of nourishment in these thin cotyledons; so further growth has to wait until the root and seed-leaves have collected and elaborated sufficient material for the formation of the second internode and its pair of leaves, which lending their help the third pair is more promptly produced, and so on.

22. Some change in the plan comes with the Silver or Soft White Maple. (Fig. 21–25). This blossoms in earliest spring, and it drops its large and ripened keys only a few weeks later. Its cotyledons have not at all the appearance of leaves; they are short and broad, and (as there is no room to be saved by folding) they are straight, except a small fold at the top, — a vestige of the habit of Maples in general. Their unusual thickness is due

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Fig. 11. Embryo of Sugar Maple, cut through lengthwise and taken out of the seed. 12, 13. Whole embryo of same just beginning to grow; *a*, the stemlet or caulicle, which in 13 has considerably lengthened.

to the large store of nutritive matter they contain, and this prevents their developing into actual leaves. Correspondingly, their caulicle does not lengthen to elevate them above the surface of the soil; the growth below the cotyledons is nearly all of root. It is the little plumule or bud between

them which makes the upward growth, and which, being well fed by the cotyledons, rapidly develops the next pair of leaves and raises them upon a long internode, and so on. The cotyledons all the while remain below, in the husk of the fruit and seed, and perish when they have yielded up the store of food which they contained.

23. So, even in plants so much alike as Maples, there is considerable difference in the amount of food stored up in the cotyledons by which the growth is to be made; and there are corresponding differences in the ger-

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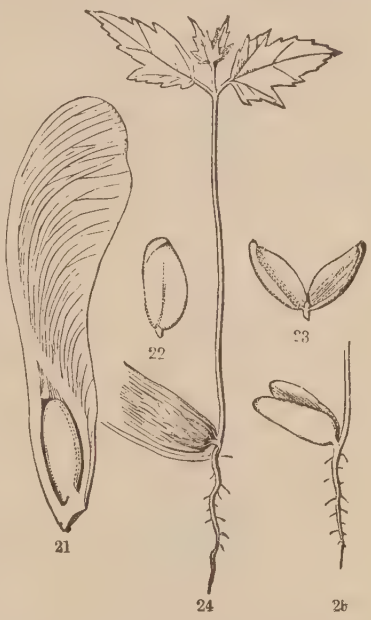
FIG. 14. One of the pair of keys or winged fruits of Red Maple; the seed-bearing portion cut open to show the seed. 15. Seed enlarged, and divided to show the crumpled embryo which fills it. 16. Embryo taken out and partly opened. 17. Embryo which has unfolded in early stage of germination and begun to grow. 18. Seedling with next joint of stem and leaves apparent; and 19 with these parts full-grown, and bud at apex for further growth. 20. Seedling with another joint of stem and pair of leaves.

mination. The larger the supply to draw upon, the stronger the growth, and the quicker the formation of root below and of stem and leaves above. This deposit of food thickens the cotyledons, and renders them less and less leaf-like in proportion to its amount.



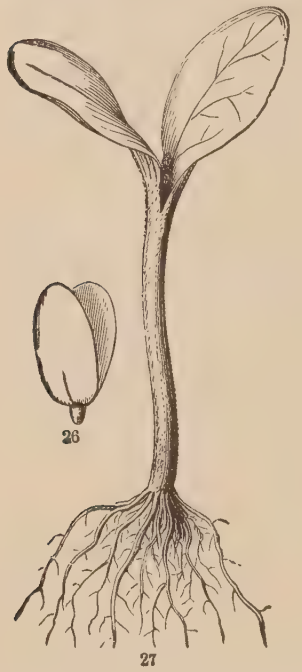
24. **Examples of Embryos with thickened Cotyledons.** In the Pumpkin and Squash (Fig. 26, 27), the cotyledons are well supplied with nourishing matter, as their sweet taste demonstrates. Still, they are flat and not very thick. In germination this store is promptly utilized in the development of the caulicle to twenty or thirty times its length in the seed, and to corresponding thickness, in the formation of a cluster of roots at its lower end, and the early production of the incipient plumule; also in their own growth into efficient green leaves. The case of our common Bean (Phaseolus vulgaris, Fig. 28–30) is nearly the same, except that the cotyledons are much more gorged; so that, although carried up into the air and light upon the lengthening caulicle, and there acquiring a green color, they never expand into useful leaves. Instead of this, they nourish into rapid growth the plumule, which is plainly visible in the seed, as a pair of incipient leaves; and these form the first actual foliage.

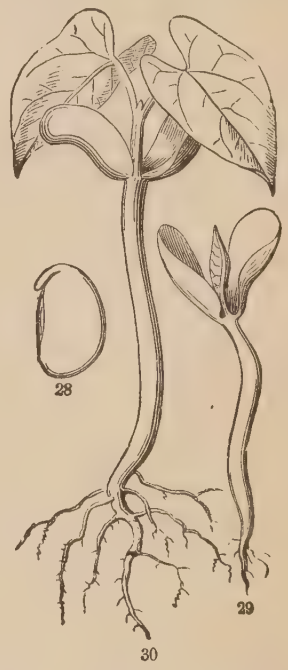
25. Very similar is the germination of the Beech (Fig. 31–33), except that the caulicle lengthens less, hardly raising the cotyledons out of the ground. Nothing would be gained by elevating them, as they never grow out into efficient leaves; but the joint of stem belonging to the plumule lengthens well, carrying up its pair of real foliage-leaves.

26. It is nearly the same in the Bean of the Old World (Vicia Faba, here called Horse Bean and Windsor Bean): the caulicle lengthens very little, does not undertake to elevate the heavy seed, which is left below or

FIG. 21. Fruit (one key) of Silver Maple, Acer dasycarpum, of natural size, the seed-bearing portion divided to show the seed. 22. Embryo of the seed taken out. 23. Same opened out, to show the thick cotyledons and the little plumule or bud between them. 24. Germination of Silver Maple, natural size; merely the base of the fruit, containing the seed, is shown. 25. Embryo of same, taken out of the husk; upper part of growing stem cut off, for want of room.

upon the surface of the soil, the flat but thick cotyledons remaining in it, and supplying food for the growth of the root below and the plumule above. In its near relative, the Pea (Fig. 34, 35), this use of cotyledons





for storage only is most completely carried out. For they are thickened to the utmost, even into hemispheres; the caulicle does not lengthen at all; merely sends out roots from the lower end, and develops its strong plumule from the upper, the seed remaining unmoved underground. That is, in technical language, the germination is *hypogæous*.

27. There is sufficient nourishment in the cotyledons of a pea to make a very considerable growth before any actual foliage is required. So it is the stem-portion of the plumule which is at first conspicuous and strong-growing. Here, as seen in Fig. 35, its lower nodes bear each a useless leaf-scale instead of an efficient leaf, and only the later ones bear leaves fitted for foliage.

FIG. 26. Embryo of Pumpkin-seed, partly opened. 27. Young seedling of same.

FIG. 28. Embryo of Common Bean (Phaseolus vulgaris): caulicle bent down over edge of cotyledons. 29. Same germinating: caulicle well lengthened and root beginning; thick cotyledons partly spreading; and plumule (pair of leaves) growing between them. 30. Same, older, with plumule developed into internode and pair of leaves.

28. This *hypogæous* germination is exemplified on a larger scale by the Oak (Fig. 36, 37) and Horse-chestnut (Fig. 38, 39); but in these the downward growth is wholly a stout tap-root. It is not the caulicle; for

this lengthens hardly any. Indeed, the earliest growth which carries the very short caulicle out of the shell comes from the formation of footstalks to the cotyledons; above these develops the strong plumule, below grows the stout root. The growth is at first entirely, for a long time

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FIG. 31. A Beech-nut, cut across. 32. Beginning germination of the Beech, showing the plumule growing before the cotyledons have opened or the root has scarcely formed. 33. The same, a little later, with the plumule-leaves developing, and elevated on a long internode.

FIG. 34. Embryo of Pea, i. e. a pea with the coats removed; the short and thick caulicle presented to view. 35. Same in advanced germination: the plumule has developed four or five internodes, bearing single leaves; but the first and second leaves are mere scales, the third begins to serve as foliage; the next more so

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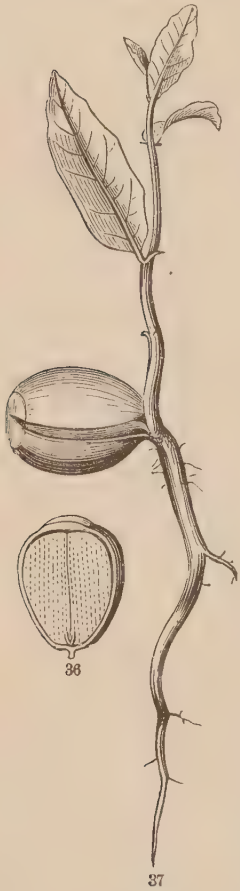
mainly, at the expense of the great store of food in the cotyledons. These, after serving their purpose, decay and fall away.

29. Such thick cotyledons never separate; indeed, they sometimes grow together by some part of their contiguous faces; so that the germination



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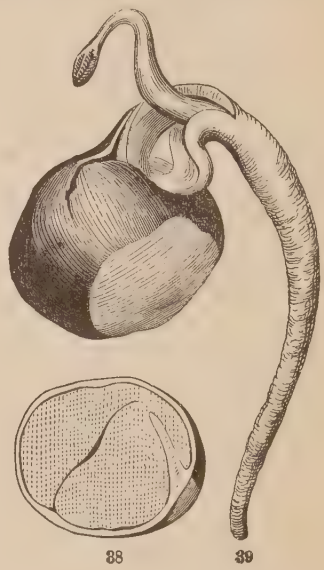

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seems to proceed from a solid bulb-like mass. This is the case in a horse-chestnut.

30. **Germinating Embryo supplied by its own Store of Nourishment**, i. e. the store in the cotyledons. This is so in all the illustrations thus far, essentially so even in the Flax. This nourishment was supplied by the mother plant to the ovule and seed, and thence taken into the embryo during its growth. Such embryos, filling the whole seed, are comparatively large and strong, and vigorous in germination in proportion to the amount of their growth while connected with the parent plant.

31. **Germinating Embryo supplied from a Deposit outside of Itself.** This is as common as the other mode; and it occurs in all degrees.

FIG. 36. Half of an acorn, cut lengthwise, filled by the very thick cotyledons, the base of which encloses the minute caulicle. 37. Oak-seedling.

FIG. 38. Half of a horse-chestnut, similarly cut; the caulicle is curved down on the side of one of the thick cotyledons. 39. Horse-chestnut in germination; foot stalks are formed to the cotyledons, pushing out in their lengthening the growing parts.

Some seeds have very little of this deposit, but a comparatively large embryo, with its parts more or less developed and recognizable. In others this deposit forms the main bulk of the seed, and the embryo is small or minute, and comparatively rudimentary. The following illustrations exemplify these various grades. When an embryo in a seed is thus surrounded by a white substance, it was natural to liken the latter to the white of an egg, and the embryo or germ to the yolk. So the matter around or by the side of the embryo was called the *Albumen*, i. e. the white of the seed. The analogy is not very good; and to avoid ambiguity some botanists call it the ENDOSPERM. As that means in English merely the inwards of a seed, the new name is little better than the old one; and, since we do not change names in botany except when it cannot be avoided, this name of *albumen* is generally kept up. A seed with such a deposit is *albuminous*, one with none is *exalbuminous*.

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32. The ALBUMEN forms the main bulk of the seed in wheat, maize, rice, buckwheat, and the like. It is the floury part of the seed. Also of the cocoa-nut, of coffee (where it is dense and hard), etc.; while in peas, beans, almonds, and in most edible nuts, the store of food, although essentially the same in nature and in use, is in the embryo itself, and therefore is not counted as anything to be separately named. In both forms this concentrated food for the germinating plant is food also for man and for animals.

33. For an albuminous seed with a well-developed embryo, the common Morning Glory (Ipomœa purpurea, Fig. 40–43) is a convenient example, being easy and prompt to grow, and having all the parts well apparent. The seeds (duly soaked for examination) and the germination should be compared with those of Sugar and Red Maple (19–21). The only essential difference is that here the embryo is surrounded by and crumpled up in the albumen. This substance, which is pulpy or mucilaginous in fresh and young seeds, hardens as the seed ripens, but becomes again pulpy in germination; and, as it liquifies, the thin cotyledons absorb it by their

FIG. 40. Seed of Morning Glory divided, moderately magnified; shows a longitudinal section through the centre of the embryo as it lies crumpled in the albumen. 41. Embryo taken out whole and unfolded; the broad and very thin cotyledons notched at summit; the caulicle below. 42. Early state of germination. 43. Same, more advanced; caulicle or primary stem, cotyledons or seed leaves, and below, the root, well developed.

whole surface. It supplements the nutritive matter contained in the embryo. Both together form no large store, but sufficient for establishing the seedling, with tiny root, stem, and pair of leaves for initiating its independent growth; which in due time proceeds as in Fig. 44, 45.

34. Smaller embryos, less developed in the seed, are more dependent upon the extraneous supply of food. The figures 46–53 illustrate four

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grades in this respect. The smallest, that of the Peony, is still large enough to be seen with a hand magnifying glass, and even its cotyledons may be discerned by the aid of a simple stage microscope.

35. The broad cotyledons of Mirabilis, or Four-o'clock (Fig. 52, 53), with the slender caulicle almost encircle and enclose the floury albumen, instead of being enclosed in it, as in the other illustrations. Evidently here the germinating embryo is principally fed by one of the leaf-like cotyledons, the other being out of contact with the supply. In the embryo of Abronia (Fig. 54, 55), a near relative of Mirabilis, there is a singular modification; one cotyledon is almost wanting, being reduced to a rudiment, leaving it for the other to do the work. This leads to the question of the

36. **Number of Cotyledons.** In all the preceding illustrations, the embryo, however different in shape and degree of development, is evidently

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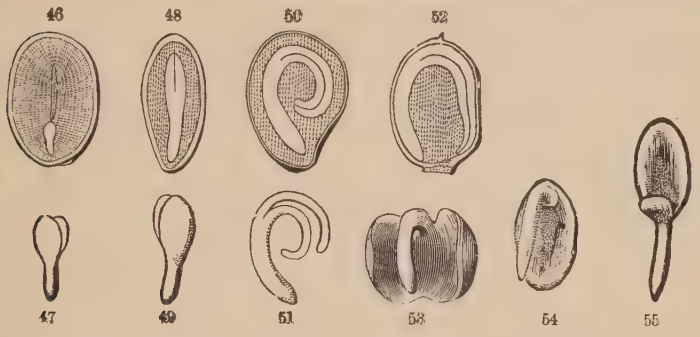
FIG. 44. Seedling of Morning Glory more advanced (root cut away); cotyledons well developed into foliage-leaves: succeeding internode and leaf well developed, and the next forming. 45. Seedling more advanced; reduced to much below natural size.

constructed upon one and the same plan, namely, that of two leaves on a caulicle or initial stem, — a plan which is obvious even when one cotyledon becomes very much smaller than the other, as in the rare instance of Abronia (Fig. 54, 55). In other words, the embryos so far examined are all

37. **Dicotyledonous**, that is, two-cotyledoned. Plants which are thus similar in the plan of the embryo agree likewise in the general structure of



their stems, leaves, and blossoms; and thus form a class, named from their embryo DICOTYLEDONES, or in English, DICOTYLEDONOUS PLANTS. So long a name being inconvenient, it may be shortened into DICOTYLS.

38. **Polycotyledonous** is a name employed for the less usual case in which there are more than two cotyledons. The Pine is the most familiar case. This occurs in all Pines, the number of cotyledons varying from three to twelve; in Fig. 56, 57 they are six. Note that they are all on the same level, that is, belong to the same node, so as to form a circle or *whorl* at the summit of the caulicle. When there are only three cotyledons, they divide the space equally, are one third of the circle apart. When only two they are 180° apart, that is, are *opposite*.

39. The case of three or more cotyledons, which is constant in Pines and in some of their relatives (but not in all of them), is occasional among Dicotyls. And the polycotyledonous is only a variation of the dicotyledonous type, — a difference in the number of leaves in the whorl; for a pair is a whorl reduced to two members. Some suppose that there are really only

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FIG. 46. Section of a seed of a Peony, showing a very small embryo in the albumen, near one end. 47. This embryo detached, and more magnified.

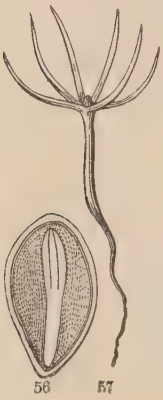
FIG. 48. Section of a seed of Barberry, showing the straight embryo in the middle of the albumen. 49. Its embryo detached.

FIG. 50. Section of a Potato-seed, showing the embryo coiled in the albumen. 51. Its embryo detached.

FIG. 52. Section of the seed of Mirabilis or Four-o'clock, showing the embryo coiled round the outside of the albumen. 53. Embryo detached; showing the very broad and leaf-like cotyledons, applied face to face, and the pair incurved.

FIG. 54. Embryo of Abronia umbellata; one of the cotyledons very small. 55. Same straightened out.

two cotyledons even in a Pine-embryo, but these divided or split up congenitally so as to imitate a greater number. But as leaves are often in whorls on ordinary stems, they may be so at the very beginning.



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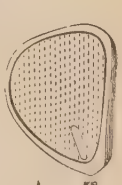
40. **Monocotyledonous** (meaning with single cotyledon) is the name of the one-cotyledoned sort of embryo. This goes along with peculiarities in stem, leaves, and flowers; which all together associate such plants into a great class, called MONOCOTYLEDONOUS PLANTS, or, for shortness, MONOCOTYLS. It means merely that the leaves are alternate from the very first.



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41. In Iris (Fig. 58, 59) the embryo in the seed is a small cylinder at one end of the mass of the albumen, with no apparent distinction of parts. The end which almost touches the seed-coat is caulicle; the other end belongs to the solitary cotyledon. In germination the whole lengthens (but mainly the cotyledon) only enough to push the proximate end fairly out of the seed: from this end the root is formed; and from a little higher the plumule later emerges. It would appear, therefore, that the cotyledon answers to a minute leaf rolled up, and that a chink through which the plumule grows out is a part of the inrolled edges. The embryo of Indian Corn shows these parts on a larger scale and in a more open state (Fig. 66–68). There, in the seed, the cotyledon remains, imbibing nourishment from the softened albumen, and transmitting it to the growing root below and new-forming leaves above.

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42. The general plan is the same in the Onion (Fig. 60–65), but with a striking difference. The embryo is long, and coiled in the albumen of the seed. To ordinary examination it shows no distinction of parts. But germination plainly shows that all except the lower end of it is cotyledon. For after it has lengthened into a long thread, the chink from which the

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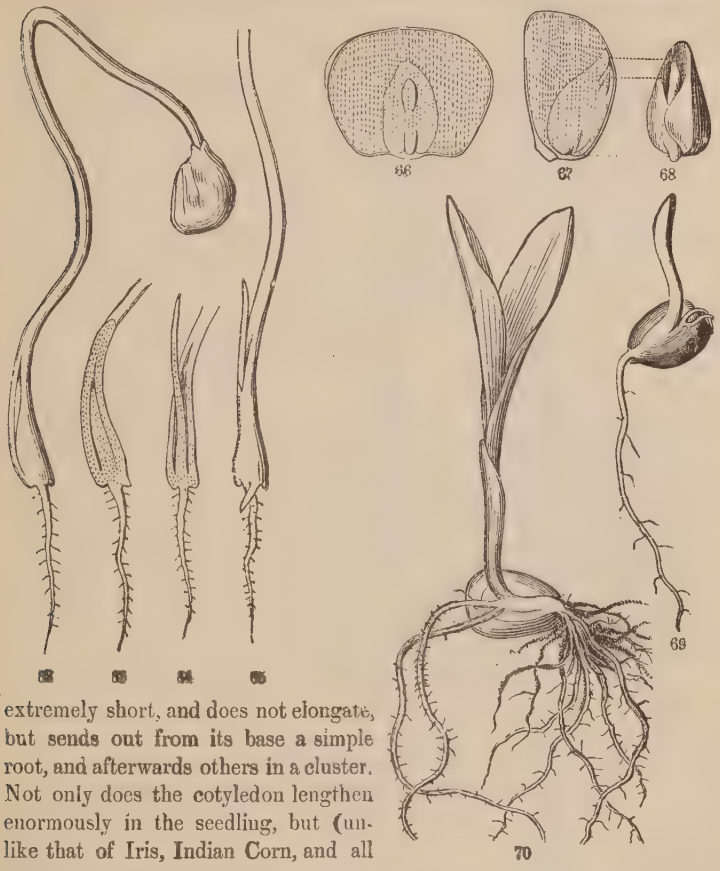
FIG. 56. Section of a Pine-seed, showing its polycotyledonous embryo in the centre of the albumen; moderately magnified. 57. Seedling of same, showing the freshly expanded six cotyledons in a whorl, and the plumule just appearing.

Fig. 58 Section of a seed of the Iris, or Flower-de-Luce, enlarged, showing its small embryo in the albumen, near the bottom. 59. A germinating seedling of the same, its plumule developed into the first four leaves (alternate), the first one rudimentary; the cotyledon remains in the seed.

FIG. 60. Section of an Onion-seed, showing the slender and coiled embryo in the albumen; moderately magnified. 61. Seed of same in early germination.

plumule in time emerges is seen at the base, or near it; so the caulicle is



extremely short, and does not elongate, but sends out from its base a simple root, and afterwards others in a cluster. Not only does the cotyledon lengthen enormously in the seedling, but (unlike that of Iris, Indian Corn, and all

FIG. 62. Germinating Onion, more advanced; the chink at base of cotyledon opening for the protrusion of the plumule, consisting of a thread-shaped leaf. 63. Section of base of Fig. 62, showing plumule enclosed. 64. Section of same later; plumule emerging. 65. Later stage of 62; upper part cut off. 66. A grain of Indian Corn, flatwise, cut away a little, so as to show the embryo, lying on the albumen, which makes the principal bulk of the seed. 67. A grain cut through the middle in the opposite direction, dividing the embryo through its thick cotyledon and its plumule, the latter consisting of two leaves, one enclosing the other. 68. The embryo, taken out whole: the thick mass is the cotyledon; the narrow body partly enclosed by it is the plumule; the little projection at its base is the very short radicle enclosed in the sheathing base of the first leaf of the plumule.

FIG. 69. Grain of Indian Corn in germination; the ascending sprout is the first leaf of the plumule, enclosing the younger leaves within; at its base the primary root has broken through. 70. The same, advanced; the second and third leaves developing, while the sheathing first leaf does not further develop.

the cereal grains) it raises the comparatively light seed into the air, the tip still remaining in the seed and feeding upon the albumen. When this food is exhausted and the seedling is well established in the soil, the upper end decays and the emptied husk of the seed falls away.

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43. In Maize or Indian Corn (Fig. 66–70), the embryo is more developed in the seed, and its parts can be made out. It lies against the starchy albumen, but is not enclosed therein. The larger part of it is the cotyledon, thickish, its edges involute, and its back in contact with the albumen; partly enclosed by it is the well-developed plumule or bud which is to grow. For the cotyledon remains in the seed to fulfil its office of imbibing nourishment from the softened albumen, which it conveys to the growing sprout; the part of this sprout which is visible is the first leaf of the plumule rolled up into a sheath and enclosing the rudiments of the succeeding leaves, at the base enclosing even the minute caulicle. In germination the first leaf of the plumule develops only as a sort of sheath, protecting the tender parts within; the second and the third form the first foliage. The caulicle never lengthens: the first root, which is formed at its lower end, or from any part of it, has to break through the enclosing sheath; and succeeding roots soon spring from all or any of the nodes of the plumule.

44. **Simple-stemmed Plants** are thus built up, by the continuous production of one leaf-bearing portion of stem from the summit of the preceding one, beginning with the initial stem (or caulicle) in the embryo. Some Dicotyls and many Monocotyls develop only in this single line of growth (as to parts above ground) until the flowering state is approached. For some examples, see Cycas (Fig. 71, front, at the left); a tall Yucca or Spanish Bayonet, and two Cocoa-nut Palms behind; at the right, a group of Sugar-canes, and a Banana behind.

FIG. 71. Simple-stemmed vegetation.

Section IV. GROWTH FROM BUDS: BRANCHING.

45. Most plants increase the amount of their vegetation by branching, that is, by producing lateral shoots.

46. Roots branch from any part and usually without definite order. Stems normally give rise to branches only at definite points, namely, at the nodes, and there only from the axils of leaves.

47. **Buds** (Fig. 72, 73). Every incipient shoot is a *Bud* (12). A stem continues its growth by its *terminal bud;* it branches by the formation and development of *lateral buds.* As normal lateral buds occupy the axils of leaves, they are called *axillary buds.* As leaves are symmetrically arranged on the stem, the buds in their axils and the branches into which axillary buds grow partake of this symmetry. The most conspicuous buds are the scaly winter-buds of most shrubs and trees of temperate and cold climates; but the name belongs as well to the forming shoot or branch of any herb.

72 73

48. **The Terminal Bud**, in the most general sense, may be said to exist in the embryo, — as cotyledons, or the cotyledons and plumule, — and to crown each successive growth of the simple stem so long as the summit is capable of growth The whole ascending growth of the Palm, Cycas, and the like (such as in Fig. 71) is from a terminal bud. Branches, being repetitions of the main stem and growing in the same way, are also lengthened by terminal buds. Those of Horse-chestnut, Hickory, Maples, and such trees, being the resting buds of winter, are conspicuous by their protective covering of scales. These bud-scales, as will hereafter be shown, are themselves a kind of leaves.

49. **Axillary Buds** were formed on these annual shoots early in the summer. Occasionally they grow the same season into branches; at least, some of them are pretty sure to do so whenever the growing terminal bud at the end of the shoot is injured or destroyed. Otherwise they may lie dormant until the following spring. In many trees or shrubs these axillary buds do not show themselves until spring; but if searched for, they may be detected, though of small size, hidden under the bark. Sometimes, although early

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Fig. 72. Shoot of Horse-chestnut, of one year's growth, taken in autumn after the leaves have fallen; showing the large terminal bud and smaller axillary buds.

Fig. 73. Similar shoot of Shagbark Hickory, Carya alba.

formed, they are concealed all summer long under the base of the leaf-stalk, which is then hollowed out into a sort of inverted cup, like a candle-extinguisher, to cover them; as in the Locust, the Yellow-wood, or more strikingly in the Button-wood or Plane-tree (Fig. 74).

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50. The *leaf-scars*, so conspicuous in Fig. 72, 73, under each axillary bud, mark the place where the stalk of the subtending leaf was attached until it fell in autumn.

51. **Scaly Buds**, which are well represented in Fig. 72, 73, commonly belong to trees and shrubs of countries in which growth is suspended during winter. The scaly coverings protect the tender young parts beneath, not so much by keeping out the cold, which of course would penetrate the bud in time, as by shielding the interior from the effects of sudden changes. There are all gradations between these and

52. **Naked Buds**, in which these scales are inconspicuous or wanting, as in most herbs, at least above ground, and most tropical trees and shrubs. But nearly related plants of the same climate may differ widely in this respect. Rhododendrons have strong and scaly winter-buds; while in Kalmia they are naked. One species of Viburnum, the Hobble-bush, has completely naked buds, what would be a pair of scales developing into the first leaves in spring; while another (the Snowball) has conspicuous scaly buds

53. **Vigor of Vegetation from strong buds.** Large and strong buds, like those of the Horse-chestnut, Hickory, and the like, contain several leaves, or pairs of leaves, ready formed, folded and packed away in small compass, just as the seed-leaves of a strong embryo are packed away in the seed: they may even contain all the blossoms of the ensuing season, plainly visible as small buds. And the stems upon which these buds rest are filled with abundant nourishment, which was deposited the summer before in the

FIG. 74. An axillary bud, concealed under the hollowed base of the leafstalk, in Buttonwood or Plane-tree.

wood or in the bark. Under the surface of the soil, or on it covered with the fallen leaves of autumn, similar strong buds of our perennial herbs may be found; while beneath are thick roots, rootstocks, or tubers, charged with a great store of nourishment for their use. This explains how it is that vegetation from such buds shoots forth so vigorously in the spring of the year, and clothes the bare and lately frozen surface of the soil, as well as the naked boughs of trees, very promptly with a covering of fresh green, and often with brilliant blossoms. Everything was prepared, and even formed, beforehand: the short joints of stem in the bud have only to lengthen, and to separate the leaves from each other so that they may unfold and grow. Only a small part of the vegetation of the season comes directly from the seed, and none of the earliest vernal vegetation. This is all from buds which have lived through the winter.

54. **The Arrangement of Branches**, being that of axillary buds, answers to that of the leaves. Now leaves principally are either *opposite* or *alternate*. Leaves are *opposite* when there are two from the same joint of stem, as in Maples (Fig. 20), the two being on opposite sides of the stem; and so the axillary buds and branches are opposite, as in Fig. 75. Leaves are *alternate* when there is only one from each joint of stem, as in the Oak, Lime-tree, Poplar, Button-wood (Fig. 74), Morning-Glory (Fig. 45, — not counting the seed-leaves, which of course are opposite, there being a pair of them); also in Indian Corn (Fig. 70), and Iris (Fig. 59). Consequently the axillary buds are also alternate, as in Hickory (Fig. 73); and the branches they form alternate, — making a different kind of spray from the other mode, one branch shooting on one side of the stem and the next on some other. For in the alternate arrangement no leaf is on the same side of the stem as the one next above or next below it.

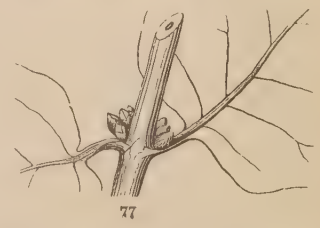
55. But the symmetry of branches (unlike that of the leaves) is rarely complete. This is due to several causes, and most commonly to the

56. **Non-development of buds.** It never happens that all the buds grow. If they did, there might be as many branches in any year as there were leaves the year before. And of those which do begin to grow, a large portion perish, sooner or later, for want of nourishment, or for want of light, or because those which first begin to grow have an advantage, which they are apt to keep, taking to themselves the nourishment of the stem, and starving the weaker buds. In the Horse-chestnut (Fig. 72), Hickory (Fig. 73), Magnolia, and most other trees with large scaly buds, the terminal bud is the strongest, and has the advantage in growth; and next in strength are the upper axillary buds: while the former continues the shoot of the last year, some of the latter give rise to branches, and the rest fail to grow. In the Lilac also (Fig. 75), the uppermost axillary buds are stronger than the lower; but the terminal bud rarely appears at all; in its place the uppermost pair of axillary buds grow, and so each stem branches every year into two, — making a repeatedly two-forked ramification, as in Fig. 76.

57. Latent Buds. Axillary buds that do not grow at the proper season, and especially those which make no appearance externally, may long remain latent, and at length upon a favorable occasion start into growth, so forming branches apparently out of place as they are out of time. The new shoots seen springing directly out of large stems may sometimes originate from such latent buds, which have preserved their life for years. But commonly these arise from

75 76

58. Adventitious Buds. These are buds which certain shrubs and trees produce anywhere on the surface of the wood, especially where it has been injured. They give rise to the slender twigs which often feather the sides of great branches of our American Elms. They sometimes form on the root, which naturally is destitute of buds; they are even found upon some leaves; and they are sure to appear on the trunks and roots of Willows, Poplars, and Chestnuts, when these are wounded or mutilated. Indeed Osier-Willows are *pollarded*, or cut off, from time to time, by the cultivator, for the purpose of producing a crop of slender adventitious twigs, suitable for basket-work. Such branches, being altogether irregular, of course interfere with the natural symmetry of the tree. Another cause of irregularity, in certain trees and shrubs, is the formation of what are called



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59. Accessory or Supernumerary Buds. There are cases where two, three, or more buds spring from the axil of a leaf, instead of the single one which is ordinarily found there. Sometimes they are placed one over the other, as in the Aristolochia or Pipe-Vine, and in the Tartarean Honeysuckle (Fig. 77); also in the Honey-Locust, and in the Walnut and Butternut (Fig. 78), where

FIG. 75. Shoot of Lilac, with winter buds; the two uppermost axillary ones strong; the terminal not developed. 76. Forking ramification of Lilac; reduced in size.

FIG. 77. Tartarean Honeysuckle, with three accessory buds in each axil

the upper supernumerary bud is a good way out of the axil and above the others. And this is here stronger than the others, and grows into a branch which is considerably out of the axil, while the lower and smaller ones commonly do not grow at all. In other cases three buds stand side by side in the axil, as in the Hawthorn, and the Red Maple (Fig. 79.) If these were all to grow into branches, they would stifle each other. But some of them are commonly flower-buds: in the Red Maple, only the middle one is a leaf-bud, and it does not grow until after those on each side of it have expanded the blossoms they contain.

78 79

60. **Sorts of Buds.** It may be useful to enumerate the kinds of buds which have been described or mentioned. They are

Terminal, when they occupy the summit of (or terminate) a stem,

Lateral, when they are borne on the side of a stem; of which the regular kind is the

Axillary, situated in the axil of a leaf. These are

Accessory or *Supernumerary*, when they are in addition to the normal solitary bud; and these are *Collateral*, when side by side; *Superposed*, when one above another;

Extra-axillary, when they appear above the axil, as some do when superposed, and as occasionally is the case when single.

Naked buds; those which have no protecting scales.

Scaly buds; those which have protecting scales, which are altered leaves or bases of leaves.

Leaf-buds, contain or give rise to leaves, and develop into a leafy shoot.

Flower-buds, contain or consist of blossoms, and no leaves.

Mixed buds, contain both leaves and blossoms.

61. **Definite annual Growth** from winter buds is marked in most of the shoots from strong buds, such as those of the Horse-chestnut and Hickory (Fig. 72, 73). Such a bud generally contains, already formed in miniature, all or a great part of the leaves and joints of stem it is to produce, makes its whole growth in length in the course of a few weeks, or sometimes even in a few days, and then forms and ripens its buds for the next year's similar growth.

62. **Indefinite annual Growth**, on the other hand, is well marked in such trees or shrubs as the Honey-Locust, Sumac, and in sterile shoots of

FIG. 78. Butternut branch, with accessory buds, the uppermost above the axil.

FIG. 79. Red-Maple branch, with accessory buds placed side by side. The annular lines toward the base in this and in Fig. 72 are scars of the bud-scales, and indicate the place of the winter-bud of the preceding year.

the Rose, Blackberry, and Raspberry. That is, these shoots are apt to grow all summer long, until stopped by the frosts of autumn or some other cause. Consequently they form and ripen no terminal bud protected by scales, and the upper axillary buds are produced so late in the season that they have no time to mature, nor has their wood time to solidify and ripen. Such stems therefore commonly die back from the top in winter, or at least all their upper buds are small and feeble; so the growth of the succeeding year takes place mainly from the lower axillary buds, which are more mature.

63. **Deliquescent and Excurrent Growth.** In the former case, and wherever axillary buds take the lead, there is, of course, no single main stem, continued year after year in a direct line, but the trunk is soon lost

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in the branches. Trees so formed commonly have rounded or spreading tops. Of such trees with *deliquescent* stems, — that is, with the trunk dissolved, as it were, into the successively divided branches, — the common American Elm (Fig. 80) is a good illustration.

64. On the other hand, the main stem of Firs and Spruces, unless destroyed by some injury, is carried on in a direct line throughout the whole growth of the tree, by the development year after year of a terminal bud: this forms a single, uninterrupted shaft, — an *excurrent* trunk, which cannot be confounded with the branches that proceed from it. Of such *spiry* or *spire-shaped* trees, the Firs or Spruces are characteristic and familiar examples There are all gradations between the two modes.

FIG. 80. An American Elm, with Spruce-trees, and on the left Arbor Vitæ.

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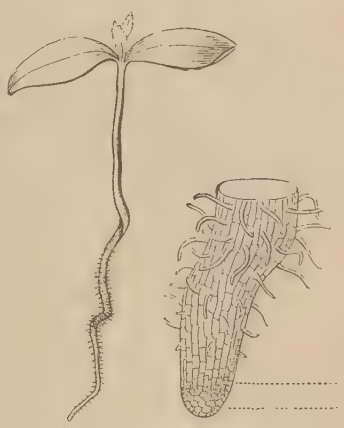
SECTION V. ROOTS.

35. **It is a property of stems to produce roots** Stems do not spring from roots in ordinary cases, as is generally thought, but roots from stems When perennial herbs arise from the ground, as they do at spring-time, they rise from subterranean stems.

66. **The Primary Root** is a downward growth from the root-end of the caulicle, that is, of the initial stem of the embryo (Fig. 5–7, 81) It it goes on to grow it makes a *main* or *tap-root*, as in Fig. 37, etc. Some plants keep this main root throughout their whole life, and send off only small side branches; as in the Carrot and Radish: and in various trees, like the Oak, it takes the lead of the side-branches for several years, unless accidentally injured, as a strong tap-root. But commonly the main root divides off very soon, and is lost in the branches. *Multiple primary roots* now and then occur, as in the seedling of Pumpkin (Fig. 27), where a cluster is formed even at the first, from the root-end of the caulicle.



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67. **Secondary Roots** are those which arise from other parts of the stem. Any part of the stem may produce them, but they most readily come from the nodes. As a general rule they naturally spring, or may be made to spring, from almost any young stem, when placed in favorable circumstances, — that is, when placed in the soil, or otherwise supplied with moisture and screened from the light. For the special tendency of the root is to avoid the light, seek moisture, and therefore to bury itself in the soil. *Propagation by division*, which is so common and so very important in cultivation, depends upon the proclivity of stems to strike root. Stems or branches which remain under ground give out roots as freely as roots themselves give off branches. Stems which creep on the ground most commonly root at the joints; so will most branches when bent to the ground, as in propagation by *layering*; and propagation by *cuttings* equally depends upon the tendency of the cut end of a shoot to produce roots. Thus, a piece of a plant which has stem and leaves, either developed or in the bud, may be made to produce roots, and so become an independent plant.

FIG. 81. Seedling Maple, of the natural size; the root well supplied with root-hairs, here large enough to be seen by the naked eye. 82. Lower end of this root, magnified, the root seen just as root-hairs are beginning to form a little behind the tip.

68. Contrast between Stem and Root. Stems are ascending axes; roots are descending axes. Stems grow by the successive development of internodes (13), one after another, each leaf-bearing at its summit (or node); so that it is of the essential nature of a stem to bear leaves. Roots bear no leaves, are not distinguishable into nodes and internodes, but grow on continuously from the lower end. They commonly branch freely, but not from any fixed points nor in definite order.

83 84 85

69. Although roots generally do not give rise to stems, and therefore do not propagate the plant, exceptions are not uncommon. For as stems may produce adventitious buds, so also may roots. The roots of the Sweet Potato among herbs, and of the Osage Orange among trees freely produce adventitious buds, developing into leafy shoots; and so these plants are propagated by *root-cuttings*. But most growths of subterranean origin which pass for roots are forms of stems, the common Potato for example.

70. Roots of ordinary kinds and uses may be roughly classed into *fibrous* and *fleshy*.

71. **Fibrous Roots**, such as those of Indian Corn (Fig. 70), of most annuals, and of many perennials, serve only for absorption: these are slender or thread-like. Fine roots of this kind, and the fine branches which most roots send out are called ROOTLETS.

72. The whole surface of a root absorbs moisture from the soil while fresh and new; and the newer roots and rootlets are, the more freely do they imbibe. Accordingly, as long as the plant grows above ground, and expands fresh foliage, from which moisture largely escapes into the air, so long it continues to extend and multiply its roots in the soil beneath, renewing and increasing the fresh surface for absorbing moisture, in proportion to the demand from above. And when growth ceases above ground, and the leaves die and fall, or no longer act, then the roots generally stop growing,

FIG. 83–85. Forms of tap-root.

and their soft and tender tips harden. From this period, therefore, until growth begins anew the next spring, is the best time for transplanting; especially for trees and shrubs.

73. The absorbing surface of young roots is much increased by the formation, near their tips, of Root-hairs (Fig. 81, 82), which are delicate

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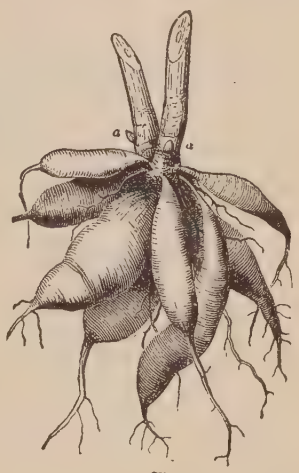

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tubular outgrowths from the surface, through the delicate walls of which moisture is promptly imbibed.

74. **Fleshy Roots** are those in which the root becomes a storehouse of nourishment. Typical roots of this kind are those of such biennials as the turnip and carrot; in which the food created in the first season's vegetation is accumulated, to be expended the next season in a vigorous growth and a rapid development of flowers, fruit, and seed. By the time the seed is matured the exhausted root dies, and with it the whole plant.

75. Fleshy roots may be single or multiple. The single root of the commoner biennials is the primary root, or tap-root, which begins to thicken in the seedling. Names are given to its shapes, such as

Conical, when it thickens most at the crown, or where it joins the stem, and tapers regularly downwards to a point, as in the Parsnip and Carrot (Fig. 84);

Turnip-shaped or *napiform*, when greatly thickened above, but abruptly becoming slender below; as the Turnip (Fig. 83); and

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Fig. 86. Sweet-Potato plant forming thickened roots. Some in the middle are just beginning to thicken; one at the left has grown more; one at the right is still larger.

Fig. 87. Fascicled fusiform roots of a Dahlia: *a*, *a*, buds on base of stem.

Spindle-shaped, or *Fusiform*, when thickest in the middle and tapering to both ends; as the common Radish (Fig. 85).

76. These examples are of primary roots. It will be seen that turnips, carrots, and the like, are not pure root throughout; for the caulicle, from the lower end of which the root grew, partakes of the thickening, perhaps also some joints of stem above: so the bud-bearing and growing top is stem.

77. A fine example of secondary roots (67), some of which remain fibrous for absorption, while a few thicken and store up food for the next season's growth, is furnished by the Sweet Potato (Fig. 86). As stated above, these are used for propagation by cuttings; for any part will produce adventitious buds and shoots. The Dahlia produces *fascicled* (i. e. clustered) fusiform roots of the same kind, at the base of the stem (Fig. 87): but these, like most roots, do not produce adventitious buds. The buds by which Dahlias are propagated belong to the surviving base of the stem above.

78 **Anomalous Roots**, as they may be called, are those which subserve other uses than absorption, food-storing, and fixing the plant to the soil.

Aerial Roots, i. e. those that strike from stems in the open air, are common in moist and warm climates, as in the Mangrove which reaches the coast of Florida, the Banyan, and, less strikingly, in some herbaceous plants, such as Sugar Cane, and even in Indian Corn. Such roots reach the ground at length, or tend to do so.

Aerial Rootlets are abundantly produced by many climbing plants, such as the Ivy, Poison Ivy, Trumpet Creeper, etc., springing from the side of stems, which they fasten to trunks of trees, walls, or other supports. These are used by the plant for climbing.

88

79. **Epiphytes, or Air-Plants** (Fig. 88), are called by the former name because commonly growing

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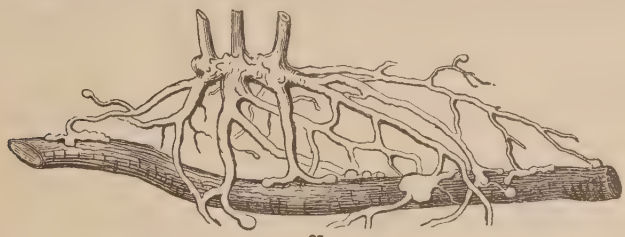
FIG. 88. Epiphytes of Florida and Georgia, viz., Epidendrum conopseum, a small Orchid, and Tillandsia usneoides, the so-called Long Moss or Black Moss, which is no moss, but a flowering plant, also *T. recurvata*; on a bough of Live Oak.

upon the trunks or limbs of other plants; by the latter because, having no connection with the soil, they must derive their sustenance from the air only. They have aerial roots, which do not reach the ground, but are used to fix the plant to the surface upon which the plant grows: they also take a part in absorbing moisture from the air.

80. **Parasitic Plants**, of which there are various kinds, strike their roots, or what answer to roots, into the tissue of foster plants, or form attachments with their surface, so as to prey upon their juices. Of this sort is the Mistletoe, the seed of which germinates on the bough where it falls or is left by birds; and the forming root penetrates the bark and engrafts itself into the wood, to which it becomes united as firmly as a natural branch to its parent stem; and indeed the parasite lives just as if it were a branch of the tree it grows and feeds on. A most common parasitic herb is the Dodder; which abounds in low grounds in summer, and coils its long and slender, leafless, yellowish stems — resembling tangled threads of yarn — round and round the stalks of other plants; wherever they touch piercing the bark with minute and very short rootlets in the form of suckers, which draw out the nourishing juices of the plants laid hold of. Other parasitic plants, like the Beech-drops and Pine-sap, fasten their roots under ground upon the roots of neighboring plants, and rob them of their juices.

81. Some plants are partly parasitic; while most of their roots act in the ordinary way, others make suckers at their tips which grow fast to the



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roots of other plants and rob them of nourishment. Some of our species of Gerardia do this (Fig. 89).

82. There are phanerogamous plants, like Monotropa or Indian Pipe, the roots of which feed mainly on decaying vegetable matter in the soil. These are SAPROPHYTES, and they imitate Mushrooms and other Fungi in their mode of life.

83. **Duration of Roots, etc.** Roots are said to be either *annual*, *biennial*, or *perennial*. As respects the first and second, these terms may be applied either to the root or to the plant.

84. **Annuals**, as the name denotes, live for only one year, generally for

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FIG. 89. Roots of Yellow Gerardia, some attached to and feeding on the root of a Blueberry-bush

only a part of the year. They are of course herbs; they spring from the seed, blossom, mature their fruit and seed, and then die, root and all. Annuals of our temperate climates with severe winters start from the seed in spring, and perish at or before autumn. Where the winter is a moist and growing season and the summer is dry, *winter annuals* prevail; their seeds germinate under autumn or winter rains, grow more or less during winter, blossom, fructify, and perish in the following spring or summer. Annuals are fibrous-rooted.

85. **Biennials**, of which the Turnip, Beet, and Carrot are familiar examples, grow the first season without blossoming, usually thicken their roots, laying up in them a stock of nourishment, are quiescent during the winter, but shoot vigorously, blossom, and seed the next spring or summer, mainly at the expense of the food stored up, and then die completely. Annuals and biennials flower only once; hence they have been called *Monocarpic* (that is, once-fruiting) plants.

86. **Perennials** live and blossom year after year. A perennial herb, in a temperate or cooler climate, usually dies down to the ground at the end of the season's growth. But subterranean portions of stem, charged with buds, survive to renew the development. Shrubs and trees are of course perennial; even the stems and branches above ground live on and grow year after year.

87. There are all gradations between annuals and biennials, and between these and perennials, as also between herbs and shrubs; and the distinction between shrubs and trees is quite arbitrary. There are perennial herbs and even shrubs of warm climates which are annuals when raised in a climate which has a winter, — being destroyed by frost. The Castor-oil plant is an example. There are perennial herbs of which only small portions survive, as off-shoots, or, in the Potato, as tubers, etc.

SECTION VI. STEMS.

88. **The Stem** is the axis of the plant, the part which bears all the other organs. Branches are secondary stems, that is, stems growing out of stems. The stem at the very beginning produces roots, in most plants a single root from the base of the embryo-stem, or caulicle. As this root becomes a *descending axis*, so the stem, which grows in the opposite direction is called the *ascending axis*. Rising out of the soil, the stem bears leaves; and leaf-bearing is the particular characteristic of the stem. But there are forms of stems that remain underground, or make a part of their growth there. These do not bear leaves, in the common sense; yet they bear rudiments of leaves, or what answers to leaves, although not in the form of foliage. The so-called stemless or *acaulescent* plants are those which bear no obvious stem (*caulis*) above ground, but only flower-stalks, and the like.

89. **Stems above ground**, through differences in duration, texture, and size, form herbs, shrubs, trees, etc., or in other terms are

Herbaceous, dying down to the ground every year, or after blossoming.

Suffrutescent, slightly woody below, there surviving from year to year.

Suffruticose or *Frutescent*, when low stems are decidedly woody below, but herbaceous above.

Fruticose or *Shrubby*, woody, living from year to year, and of considerable size, — not, however, more than three or four times the height of a man.

Arborescent, when tree-like in appearance or mode of growth, or approaching a tree in size.

Arboreous, when forming a proper tree-trunk.

90. As to direction taken in growing, stems may, instead of growing upright or erect, be

Diffuse, that is, loosely spreading in all directions.

Declined, when turned or bending over to one side.

Decumbent, reclining on the ground, as if too weak to stand.

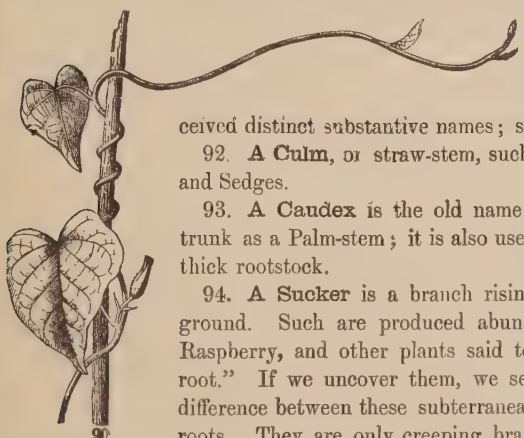
Assurgent or *Ascending*, rising obliquely upwards.

Procumbent or *Prostrate*, lying flat on the ground from the first.

Creeping or *Repent*, prostrate on or just beneath the ground, and striking root, as does the White Clover, the Partridge-berry, etc.

Climbing or *Scandent*, ascending by clinging to other objects for support, whether by *tendrils*, as do the Pea, Grape-Vine, and Passion-flower and Virginia Creeper (Fig. 92, 93); by their twisting leaf-stalks, as the Virgin's Bower; or by rootlets, like the Ivy, Poison Ivy, and Trumpet Creeper.

Twining or *Voluble*, when coiling spirally around other stems or supports; like the Morning-Glory (Fig 90) and the Hop.



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91. Certain kinds of stems or branches, appropriated to special uses, have received distinct substantive names; such as the following:

92. **A Culm**, or straw-stem, such as that of Grasses and Sedges.

93. **A Caudex** is the old name for such a peculiar trunk as a Palm-stem; it is also used for an upright and thick rootstock.

94. **A Sucker** is a branch rising from stems under ground. Such are produced abundantly by the Rose, Raspberry, and other plants said to multiply "by the root." If we uncover them, we see at once the great difference between these subterranean branches and real roots. They are only creeping branches under ground. Remarking how the upright shoots from these branches become separate

FIG. 90. Twining or voluble stem of Morning-Glory.

plants, simply by the dying off of the connecting under-ground stems, the gardener expedites the result by cutting them through with his spade. That is, he propagates the plant "by division."

95. **A Stolon** is a branch from above ground, which reclines or becomes prostrate and strikes root (usually from the nodes) wherever it rests on the soil. Thence it may send up a vigorous shoot, which has roots of its own, and becomes an independent plant when the connecting part dies, as it does after a while. The Currant and the Gooseberry naturally multiply in this way, as well as by suckers (which are the same thing, only the connecting part is concealed under ground). Stolons must have suggested the operation of *layering* by bending down and covering with soil branches which do not naturally make stolons; and after they have taken root, as they almost always will, the gardener cuts through the connecting stem, and so converts a rooting branch into a separate plant.

96. **An Offset** is a short stolon, or sucker, with a crown of leaves at the end, as in the Houseleek (Fig. 91), which propagates abundantly in this way.

91

97. **A Runner**, of which the Strawberry presents the most familiar and characteristic example, is a long and slender, tendril-like stolon, or branch from next the ground, destitute of conspicuous leaves. Each runner of the Strawberry, after having grown to its full length, strikes root from the tip, which fixes it to the ground, then forms a bud there, which develops into a tuft of leaves, and so gives rise to a new plant, which sends out new runners to act in the same way. In this manner a single Strawberry plant will spread over a large space, or produce a great number of plants, in the course of the summer, all connected at first by the slender runners; but these die in the following winter, if not before, and leave the plants as so many separate individuals.

98. **Tendrils** are branches of a very slender sort, like runners, not destined like them for propagation, and therefore always destitute of buds or leaves, being intended only for climbing. Simple tendrils are such as those of Passion-flowers (Fig. 92). Compound or branching tendrils are borne by the Cucumber and Pumpkin, by the Grape-Vine, Virginia Creeper, etc.

99. A tendril commonly grows straight and outstretched until it reaches some neighboring support, such as a stem, when its apex hooks around it to secure a hold; then the whole tendril shortens itself by coiling up spirally, and so draws the shoot of the growing plant nearer to the supporting object. But the tendrils of the Virginia Creeper (Ampelopsis, Fig.

Fig. 91. Houseleek (Sempervivum), with offsets

93), as also the shorter ones of the Japanese species, effect the object differently, namely, by expanding the tips of the tendrils into a flat disk, with an adhesive face. This is applied to the supporting object, and it adheres firmly; then a shortening of the tendril and its branches by coiling brings up the growing shoot close to the support. This is an adaptation for climbing mural rocks or walls, or the trunks of trees, to which ordinary tendrils are unable to cling. The Ivy and Poison Ivy attain the same result by means of aerial rootlets (78).

92

100. Some tendrils are leaves or parts of leaves, as those of the Pea (Fig. 35). The nature of the tendril is known by its position. A tendril from the axil of a leaf, like that of Passion-flowers (Fig. 92) is of course a stem, i. e. a branch. So is one which terminates a stem, as in the Grape-Vine.

101. **Spines** or **Thorns** (Fig. 95, 96) are commonly stunted and hardened branches or tips of stems or branches, as are those of Hawthorn, Honey-Locust, etc. In the Pear and Sloe all gradations occur between spines and spine-like (spinescent) branches. Spines

93 94

may be reduced and indurated leaves; as in the Barberry, where their nature is revealed by their situation, underneath an axillary bud. But

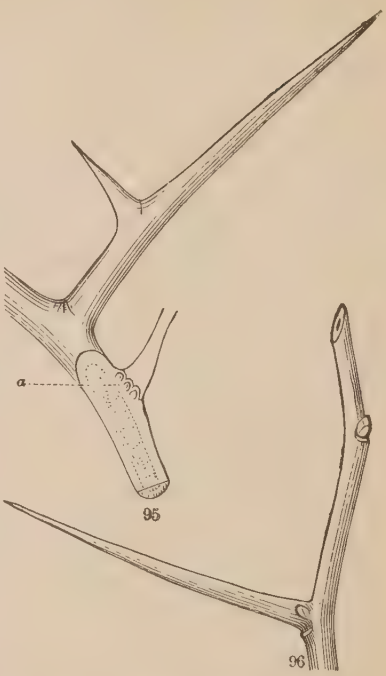
FIG 92. A small Passion-flower (*Passiflora sicyoides*), showing the tendrils.

FIG. 93. Piece of the stem of Virginia Creeper, bearing a leaf and a tendril. 94. Tips of a tendril, about the natural size, showing the disks by which they hold fast to walls, etc.

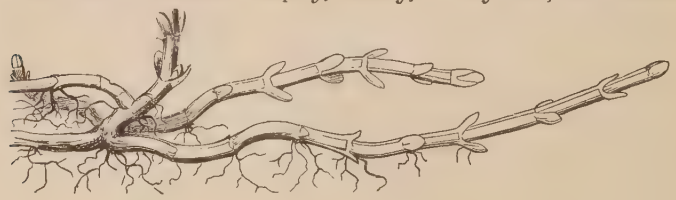
prickles, such as those of Blackberry and Roses, are only excrescences of the bark, and not branches.

102. Equally strange forms of stems are characteristic of the Cactus family (Fig. 111). These may be better understood by comparison with

103. **Subterranean Stems and Branches.** These are very numerous and various; but they are commonly overlooked, or else are confounded with roots. From their situation they are out of ordinary sight; but they will well repay examination. For the vegetation that is carried on under ground is hardly less varied or important than that above ground. All their forms may be referred to four principal kinds: namely, the *Rhizoma* (*Rhizome*) or *Rootstock*, the *Tuber*, the *Corm* or solid bulb, and the true *Bulb*.



104. **The Rootstock, or Rhizoma**, in its simplest form, is merely a creeping stem or branch growing beneath the surface of the soil, or partly covered by it. Of this kind are the so-called *creeping*, *running*, or *scaly roots*, such as those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by which the Mint (Fig. 97), the Couch-grass, or Quick-grass, and many other plants, spread so rapidly and widely, — "by the root," as it is said That these are really *stems*, and not roots, is evident from the way in which

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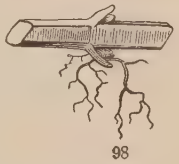
FIG. 95. A branching thorn of Honey Locust, being an indurated leafless branch developed from an accessory bud far above the axil: at the cut portion below, three other buds (*a*) are concealed under the petiole.

FIG. 96. Spine of Cockspur Thorn, developed from an axillary bud, as the leaf scar below witnesses: an accessory leaf-bud is seen at its base.

FIG. 97. Rootstocks, or creeping subterranean branches, of the Peppermint.

they grow; from their consisting of a succession of joints; and from the leaves which they bear on each *node*, in the form of small scales, just like the lowest ones on the upright stem next the ground. They also produce buds in the axils of these scales, showing the scales to be leaves; whereas real roots bear neither leaves nor axillary buds. Placed as they are in the damp and dark soil, such stems naturally produce roots, just as the creeping stem does where it lies on the surface of the ground.

105. It is easy to see why plants with these running rootstocks take such rapid and wide possession of the soil, and why they are so hard to get rid of. They are always perennials; the subterranean shoots live over the first winter, if not longer, and are provided with vigorous buds at every joint. Some of these buds grow in spring into upright stems, bearing foliage, to elaborate nourishment, and at length produce blossoms for reproduction by seed; while many others, fed by nourishment supplied from above, form a new generation of subterranean shoots; and this is repeated over and over in the course of the season or in succeeding years. Meanwhile, as the subterranean shoots increase in number, the older ones, connecting the successive growths, die off year by year, liberating the already rooted side-branches as so many separate plants; and so on indefinitely. Cutting these running rootstocks into pieces, therefore, by the hoe or the plough, far from destroying the plant, only accelerates the propagation; it converts one many-branched plant into a great number of separate individuals. Cutting into pieces only multiplies the pest; for each piece (Fig. 98) is already a plantlet, with its roots and with a bud in the axil of its scale-like leaf (either latent or apparent), and with prepared nourishment enough to develop this bud into a leafy stem; and so a single plant is all the more speedily converted into a multitude. Whereas, when the subterranean parts are only roots, cutting away the stem completely destroys the plant, except in the rather rare cases where the root freely produces adventitious buds.



98

106. Rootstocks are more commonly thickened by the storing up of considerable nourishing matter in their tissue. The common species of Iris (Fig. 164) in the gardens have stout rootstocks, which are only partly covered by the soil, and which bear foliage-leaves instead of mere scales, closely covering the upper part, while the lower produces roots. As the leaves die, year by year, and decay, a scar left in the form of a ring marks the place where each leaf was attached, that is, marks so many nodes, separated by very short internodes.

107. Some rootstocks are marked with large round scars of a different

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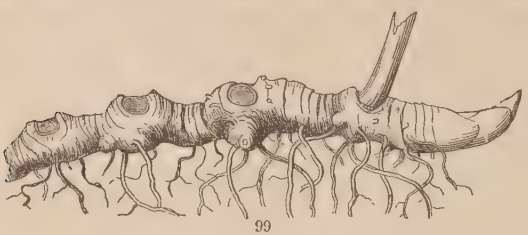
FIG. 98. A piece of the running rootstock of the Peppermint, with its node or joint, and an axillary bud ready to grow.

sort, like those of the Solomon's Seal (Fig. 99), which gave this name to the plant, from their looking somewhat like the impression of a seal upon wax. Here the rootstock sends up every spring an herbaceous stalk or stem, which bears the foliage and flowers, and dies in autumn. The *seal* is the circular



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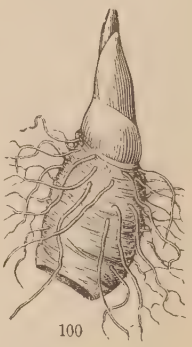
scar left by the death and separation of the base of the stout stalk from the living rootstock. As but one of these is formed each year, they mark the limits of a year's growth. The bud at the end of the rootstock in the figure (which was taken in summer) will grow the next spring into the stalk of the season, which, dying in autumn, will leave a similar scar, while another bud will be formed farther on, crowning the ever-advancing summit or growing end of the stem.



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108. As each year's growth of stem makes its own roots, it soon becomes independent of the older parts. And after a certain age, a portion annually dies off behind, about as fast as it increases at the growing end, death following life with equal and certain step, with only a narrow interval. In vigorous plants of Solomon's Seal or Iris, the living rootstock is several inches or a foot in length; while in the short rootstock of Trillium or Birthroot (Fig. 100) life is reduced to a narrower span.

109. An upright or short rootstock, like this of Trillium, is commonly called a CAUDEX (93); or when more shortened and thickened it would become a corm.

110. A Tuber may be understood to be a portion of a rootstock thickened, and with buds (eyes) on the sides. Of course, there are all gradations between a tuber and a rootstock. Helianthus tuberosus, the so-called Jerusalem Artichoke (Fig. 101), and the common Potato, are typical and familiar examples of the tuber. The stalks by which the tubers are attached to the parent stem are at once seen to be different from the roots, both in appearance and manner of growth. The scales on the tubers are the rudiments of leaves; the eyes are the buds in their axils. The Potato-plant

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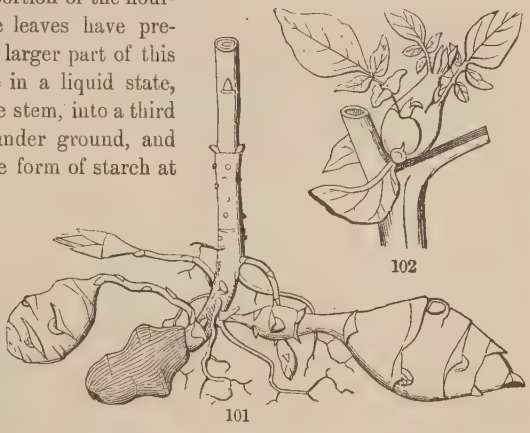
FIG. 99. Rootstock of Solomon's Seal, with the bottom of the stalk of the season, and the bud for the next year's growth.

FIG. 100. The very short rootstock and strong terminal bud of a Trillium or Birthroot.

has three forms of branches: 1. Those that bear ordinary leaves expanded in the air, to digest what they gather from it and what the roots gather from the soil, and convert it into nourishment. 2. After a while a second set of branches at the summit of the plant bear flowers, which form fruit and seed out of a portion of the nourishment which the leaves have prepared. 3. But a larger part of this nourishment, while in a liquid state, is carried down the stem, into a third sort of branches under ground, and accumulated in the form of starch at their extremities, which become tubers, or depositories of prepared solid food, — just as in the Turnip, Carrot, and Dahlia (Fig. 83–87), it is deposited in the root. The use of the store of food is obvious enough. In the autumn the whole plant dies, except the seeds (if it formed them) and the tubers; and the latter are left disconnected in the ground. Just as that small portion of nourishing matter which is deposited in the seed feeds the embryo when it germinates, so the much larger portion deposited in the tuber nourishes its buds, or eyes, when they likewise grow, the next spring, into new plants. And the great supply enables them to shoot with a greater vigor at the beginning, and to produce a greater amount of vegetation than the seedling plant could do in the same space of time; which vegetation in turn may prepare and store up, in the course of a few weeks or months, the largest quantity of solid nourishing material, in a form most available for food. Taking advantage of this, man has transported the Potato from the cool Andes of Chili to other cool climates, and makes it yield him a copious supply of food, especially important in countries where the season is too short, or the summer's heat too little, for profitably cultivating the principal grain-plants.



111. **The Corm or Solid Bulb**, like that of Cyclamen (Fig. 103), and of Indian Turnip (Fig. 104), is a very short and thick fleshy subterranean stem, often broader than high. It sends off roots from its lower end, or rather face, leaves and stalks from its upper. The corm of Cyclamen goes on to enlarge and to produce a succession of flowers and leaves year after year.

FIG. 101. Tubers of Helianthus tuberosus, called "artichokes."

FIG. 102. Bulblet-like tubers, such as are occasionally formed on the stem of a Potato-plant above ground.

That of Indian Turnip is formed one year and is consumed the next. Fig. 104 represents it in early summer, having below the corm of last year, from which the roots have fallen. It is partly consumed by the growth of the stem for the season, and the corm of the year is forming at base of the stem above the line of roots.

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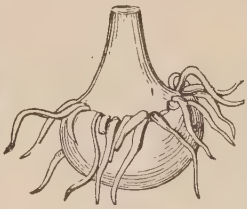

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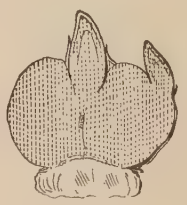
112. The corm of Crocus (Fig. 105, 106), like that of its relative Gladiolus, is also reproduced annually, the new ones forming upon the summit and sides of the old. Such a corm is like a tuber in budding from the sides, i. e. from the axils of leaves; but these leaves, instead of being small scales, are the sheathing bases of foliage-leaves which covered the surface. It resembles a true bulb in having these sheaths or broad scales; but in the corm or solid bulb, this solid part or stem makes up the principal bulk.

105

113. **The Bulb**, strictly so-called, is a stem like a reduced corm as to its solid part (or plate); while the main body consists of thickened scales, which are leaves or leaf-bases. These are like bud-scales; so that in fact a bulb is a bud with fleshy scales on an exceedingly short stem. Compare a White Lily bulb (Fig. 107) with the strong scaly buds of the Hickory and Horse-chestnut (Fig. 72 and 73), and the resemblance will appear. In corms, as in tubers and rootstocks, the store of food for future growth is deposited in the stem; while in the bulb, the greater part is deposited in the bases of the leaves, changing them into thick scales, which closely overlap or enclose one another.



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114. **A Scaly Bulb** (like that of the Lily, Fig 107, 108) is one in which the scales are thick but comparatively narrow.

115. **A Tunicated or Coated Bulb** is one in which the scales enwrap each other, forming concentric coats or layers, as in Hyacinth and Onion.

Fig. 103. Corm of Cyclamen, much reduced in size: roots from lower face, leaf-stalks and flower-stalks from the upper.

Fig. 104. Corm of Indian Turnip (Arisæma).

Fig. 105 Corm of a Crocus, the investing sheaths or dead leaf-bases stripped off. The faint cross-lines represent the scars, where the leaves were attached, i. e. the nodes: the spaces between are the internodes. The exhausted corm of the previous year is underneath; forming ones for next year on the summit and sides

Fig. 106. Section of the same.

116. **Bulblets** are very small bulbs growing out of larger ones; or small bulbs produced above ground on some plants, as in the axils of the leaves of the bulbiferous Lilies of the gardens (Fig. 110), and often in the flower-clusters of the Leek and Onion. They are plainly buds with thickened scales. They never grow into branches, but detach themselves when full grown, fall to the ground, and take root there to form new plants.

109

117. **Consolidated Vegetation.** An ordinary herb, shrub, or tree is evidently constructed on the plan developing an extensive surface. In fleshy rootstocks,

107

108

tubers, corms, and bulbs, the more enduring portion of the plant is concentrated, and reduced for the time of struggle (as against drought, heat, or cold) to a small amount of exposed surface, and this mostly sheltered in the soil. There are many similar consolidated forms which are not subterranean. Thus plants like the Houseleek (Fig. 91) imitate a bulb. Among Cactuses the columnar species of Cereus (Fig. 111, *b*), may be likened to rootstocks. A green rind serves the purpose of foliage; but the surface is as nothing compared with an ordinary leafy plant of the same bulk. Compare, for instance, the largest Cactus known, the Giant Cereus of the Gila River (Fig. 111, in the background), which rises to the height of fifty or sixty feet, with a common leafy tree of the same height, such as that in Fig. 89, and estimate how vastly greater, even without the foliage, the surface of the latter is than that of the former. Compare, in the

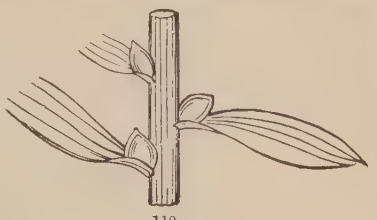
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FIG. 107. Bulb of a wild Lily. 108. The same divided lengthwise, showing two forming buds of the next generation.

FIG. 109. A ground leaf of White Lily, its base (cut across) thickened into a bulb-scale. This plainly shows that bulb-scales are leaves.

FIG. 110. Bulblets in the axils of leaves of a Tiger Lily.

same view, an Opuntia or Prickly-Pear Cactus, its stem and branches formed of a succession of thick and flattened joints (Fig. 111, *a*), which may be likened to tubers, or an Epiphyllum (*d*), having short and flat joints, with an ordinary leafy shrub or herb of equal size. And finally, in Melon-Cactuses, Echinocactus (*c*), or other globose forms (which may be likened to permanent corms), with their globular or bulb-like shapes, we have plants in the compactest shape; their spherical figure being such as to expose the least possible amount of substance to the air. These are adaptations to climates which are very dry, either throughout or for a part of the year. Similarly, bulbous and corm-bearing plants, and the like, are examples of a form of vegetation which in the growing season may expand a large surface to the air and light, while during the period of rest the living vegetable is reduced to a globe, or solid form of the least possible surface; and this protected by its outer coats of dead and dry scales, as well as by its situation under ground. Such are also adapted to a season of drought. They largely belong to countries which have a long hot season of little or no rain, when, their stalks and foliage above and their roots beneath early perishing, the plants rest securely in their compact bulbs, filled with nourishment and retaining their moisture with great tenacity, until the rainy season comes round. Then they shoot forth leaves and flowers with wonderful rapidity, and what was perhaps a desert of arid sand becomes green with foliage and gay with blossoms, almost in a day.

111

Section VII. LEAVES.

118. Stems bear leaves, at definite points (nodes, 13); and these are produced in a great variety of forms, and subserve various uses. The commonest kind of leaf, which therefore may be taken as the type or pattern, is an expanded green body, by means of which the plant exposes to the air and light the matters which it imbibes, exhales certain portions, and assimilates the residue into vegetable matter for its nourishment and growth.

119. But the fact is already familiar (10–30) that leaves occur under other forms and serve for other uses, — for the storage of food already assimilated, as in thickened seed-leaves and bulb-scales; for covering, as in bud-scales; and still other uses are to be pointed out. Indeed, sometimes they are of no service to the plant, being reduced to mere scales or rudiments, such as those on the rootstocks of Peppermint (Fig. 97) or the tubers of Jerusalem Artichoke (Fig. 101). These may be said to be of service only to the botanist, in explaining to him the plan upon which a plant is constructed.

120. Accordingly, just as a rootstock, or a tuber, or a tendril is a kind of stem, so a bud-scale, or a bulb-scale, or a cotyledon, or a petal of a flower, is a kind of leaf. Even in respect to ordinary leaves, it is natural to use the word either in a wider or in a narrower sense; as when in one sense we say that a leaf consists of blade and petiole or leaf-stalk, and in another sense say that a leaf is petioled, or that the leaf of Hepatica is three-lobed. The connection should make it plain whether by leaf we mean leaf-blade only, or the blade with any other parts it may have. And the student will readily understand that by leaf in its largest or *morphological* sense, the botanist means the organ which occupies the place of a leaf, whatever be its form or its function.

§ 1. LEAVES AS FOLIAGE.

121. This is tautological; for foliage is simply leaves: but it is very convenient to speak of typical leaves, or those which serve the plant for assimilation, as foliage-leaves, or ordinary leaves. These may first be considered.

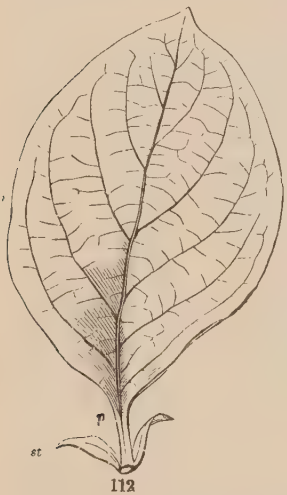
122. **The Parts of a Leaf.** The ordinary leaf, complete in its parts, consists of *blade*, *foot-stalk*, or *petiole*, and a pair of *stipules*.

123. First the Blade or Lamina, which is the essential part of ordinary leaves, that is, of such as serve the purpose of foliage. In structure it consists of a softer part, the *green pulp*, called *parenchyma*, which is traversed and supported by a fibrous frame, the parts of which are called *ribs* or *veins*, on account of a certain likeness in arrangement to the veins of animals.

The whole surface is covered by a transparent skin, the *Epidermis*, not unlike that which covers the surface of all fresh shoots.

124. Note that the leaf-blade expands horizontally, — that is, normally presents its faces one to the sky, the other to the ground, or when the leaf is erect the upper face looks toward the stem that bears it, the lower face away from it. Whenever this is not the case there is something to be explained.

125. The framework consists of *wood*, — a fibrous and tough material which runs from the stem through the leaf-stalk, when there is one, in the form of parallel threads or bundles of fibres; and in the blade these spread out in a horizontal direction, to form the *ribs* and *veins* of the leaf. The stout main branches of the framework are called the *Ribs*. When there is only one, as in Fig. 112, 114, or a middle one decidedly larger than the rest, it is called the *Midrib*. The smaller divisions are termed *Veins;* and their still smaller subdivisions, *Veinlets*. The latter subdivide again and again, until they become so fine that they are invisible to the naked eye. The fibres of which they are composed are hollow; forming tubes by which the sap is brought into the leaves and carried to every part.



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126. **Venation** is the name of the mode of veining, that is, of the way in which the veins are distributed in the blade. This is of two principal kinds; namely, the *parallel-veined*, and the *netted-veined*.

127. In *Netted-veined* (also called *Reticulated*) leaves, the veins branch off from the main rib or ribs, divide into finer and finer veinlets, and the branches unite with each other to form meshes of network. That is, they *anastomose*, as anatomists say of the veins and arteries of the body. The Quince-leaf, in Fig. 112, shows this kind of veining in a leaf with a single rib. The Maple, Basswood, Plane or Buttonwood (Fig. 74) show it in leaves of several ribs.

128. In *parallel-veined* leaves, the whole framework consists of slender ribs or veins, which run parallel with each other, or nearly so, from the base to the point of the leaf, — not dividing and subdividing, nor forming meshes, except by minute cross-veinlets. The leaf of any grass, or that of the Lily of the Valley (Fig. 113) will furnish a good illustration. Such parallel veins Linnæus called *Nerves*, and parallel-veined leaves are still commonly called *nerved* leaves, while those of the other kind are said to be

FIG. 112. Leaf of the Quince: *b*, blade; *p*, petiole; *st*, stipules.

veined, — terms which it is convenient to use, although these "nerves" and "veins" are all the same thing, and have no likeness to the *nerves* and little to the veins of animals.

129. *Netted-veined* leaves belong to plants which have a pair of seed-leaves or cotyledons, such as the Maple (Fig. 20, 24,), Beech (Fig. 33), and

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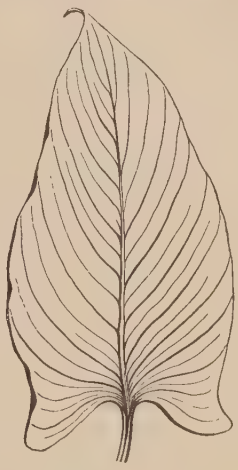

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the like; while *parallel-veined* or *nerved* leaves belong to plants with one cotyledon or true seed-leaf; such as the Iris (Fig. 59), and Indian Corn (Fig. 70). So that a mere glance at the leaves generally tells what the structure of the embryo is, and refers the plant to one or the other of these two grand classes, — which is a great convenience. For when plants differ from each other in some one important respect, they usually differ correspondingly in other respects also.

130. Parallel-veined leaves are of two sorts, — one kind, and the commonest, having the ribs or nerves all running from the base to the point of the leaf, as in the examples already given; while in another kind they run from a midrib to the margin, as in the common Pickerel-weed of our ponds, in the Banana, in Calla (Fig. 114), and many similar plants of warm climates.

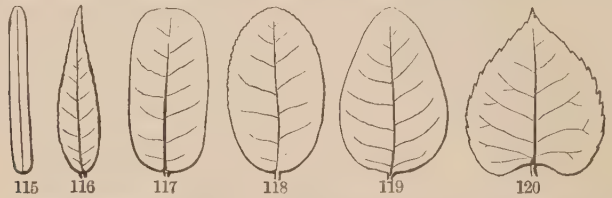
131. Netted-veined leaves are also of two sorts, as in the examples already referred to. In one case the veins all rise from a single rib (the midrib), as in Fig. 112, 116–127. Such leaves are called *Feather-veined* or *Penni-veined*, i. e. *Pinnately-veined;* both terms meaning the same thing, namely, that the veins are arranged on the sides of the rib like the plume of a feather on each side of the shaft.

FIG. 113. A (parallel-veined) leaf of the Lily of the Valley. 114. One of the Calla Lily.

132. In the other case (as in Fig. 74, 129–132), the veins branch off from three, five, seven, or nine ribs, which spread from the top of the leaf-stalk, and run through the blade like the toes of a web-footed bird. Hence these are said to be *Palmately* or *Digitately* veined, or (since the ribs diverge like rays from a centre) *Radiate-veined.*

133. Since the general outline of leaves accords with the frame-work or skeleton, it is plain that *feather-veined* (or *penni-veined*) leaves will incline to elongated shapes, or at least to be longer than broad; while in *radiate-veined* leaves more rounded forms are to be expected. A glance at the following figures shows this.

134. **Forms of Leaves as to General Outline.** It is necessary to give names to the principal shapes, and to define them rather precisely, since they afford easy marks for distinguishing species. The same terms are used



for all other flattened parts as well, such as petals; so that they make up a great part of the descriptive language of Botany. It will be a good exercise for young students to look up leaves answering to these names and definitions. Beginning with the narrower and proceeding to the broadest forms, a leaf is said to be

Linear (Fig. 115), when narrow, several times longer than wide, and of the same breadth throughout.

Lanceolate, or *Lance-shaped*, when conspicuously longer than wide, and tapering upwards (Fig. 116), or both upwards and downwards.

Oblong (Fig. 117), when nearly twice or thrice as long as broad.

Elliptical (Fig. 118) is oblong with a flowing outline, the two ends alike in width.

Oval is the same as broadly elliptical, or elliptical with the breadth considerably more than half the length.

Ovate (Fig. 119), when the outline is like a section of a hen's egg lengthwise, the broader end downward.

Orbicular, or *Rotund* (Fig. 132), circular in outline, or nearly so.

135. A leaf which tapers toward the base instead of toward the apex may be

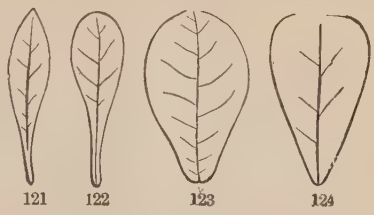
Oblanceolate (Fig. 121) when of the lance-shaped form, only more tapering toward the base than in the opposite direction.

Spatulate (Fig. 122) when more rounded above, but tapering thence to a narrow base, like an old-fashioned spatula.

FIG. 115–120. A series of shapes of feather-veined leaves.

Obovate (Fig. 123) or inversely ovate, that is, ovate with the narrower end down.

Cuneate or *Cuneiform*, that is, *Wedge-shaped* (Fig. 124), broad above and tapering by nearly straight lines to an acute angle at the base.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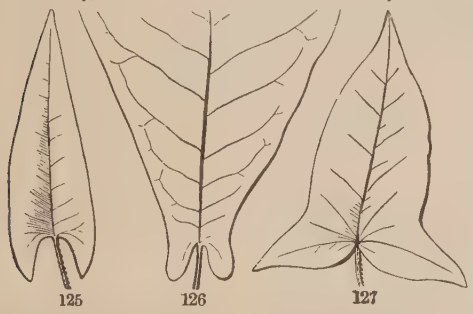
136. **As to the Base**, its shape characterizes several forms, such as *Cordate* or *Heart-shaped* (Fig. 120, 129), when a leaf of an ovate form, or something like it, has the out line of its rounded base turned in (forming a notch or *sinus*) where the stalk is attached.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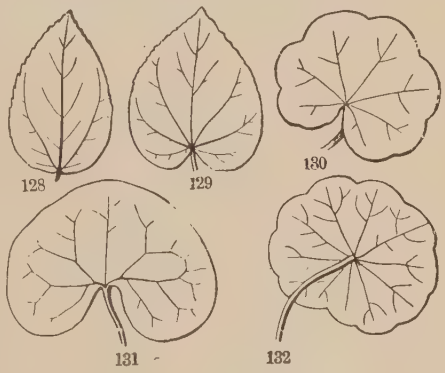
Reniform, or *Kidney-shaped* (Fig. 131), like the last, only rounder and broader than long.

Auriculate, or *Eared*, having a pair of small and blunt projections, or *ears*, at the base, as in one species of Magnolia (Fig. 126).

Sagittate, or *arrow-shaped*, where such ears are acute and turned downwards, while the main body of the blade tapers upwards to a point, as in the common Sagittaria or Arrow-head, and in the Arrow-leaved Polygonum (Fig. 125).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Hastate, or *Halberd-shaped*, when such lobes at the base point outwards, giving the shape of the halberd of the olden time, as in another Polygonum (Fig. 127).

Peltate, or *Shield-shaped* (Fig. 132), is the name applied to a curious modification of the leaf, commonly of a rounded form, where the footstalk is attached to the lower surface, instead of the base, and therefore is natu

FIG. 121, oblanceolate; 122, spatulate; 123, obovate; and 124, wedge-shaped feather-veined, leaves.

FIG. 125, sagittate; 126, auriculate; and 127, halberd-shaped or hastate leaves.

FIG. 128–132 Various forms of radiate-veined leaves.

rally likened to a shield borne by the outstretched arm. The common Watershield, the Nelumbium, and the White Water-lily, and also the Mandrake, exhibit this sort of leaf. On comparing the shield-shaped leaf of the common Marsh Pennywort (Fig. 132) with that of another common species (Fig. 130), it is at once seen that a shield-shaped leaf is like a kidney-shaped (Fig. 130, 131) or other rounded leaf, with the margins at the base brought together and united.

137. **As to the Apex,** the following terms express the principal variations: —

Acuminate, Pointed, or *Taper-pointed,* when the summit is more or less prolonged into a narrowed or tapering point; as in Fig. 133.

Acute, ending in an acute angle or not prolonged point; Fig. 134.

Obtuse, with a blunt or rounded apex; as in Fig. 135, etc.

Truncate, with the end as if cut off square; as in Fig. 136.

Retuse, with rounded summit slightly indented, forming a very shallow notch, as in Fig. 137.

Emarginate, or *Notched,* indented at the end more decidedly; as in Fig. 138.

Obcordate, that is, inversely heart-shaped, where an obovate leaf is more deeply notched at the end (Fig. 139), as in White Clover and Wood-sorrel; so as to resemble a cordate leaf inverted.

Cuspidate, tipped with a sharp and rigid point; as in Fig. 140.

Mucronate, abruptly tipped with a small and short point, like a mere projection of the midrib; as in Fig. 141.

Aristate, Awn-pointed, and *Bristle-pointed,* are terms used when this mucronate point is extended into a longer bristle-form or slender appendage.

The first six of these terms can be applied to the lower as well as to the upper end of a leaf or other organ. The others belong to the apex only.

138. **As to degree and nature of Division,** there is first of all the difference between

Simple Leaves, those in which the blade is of one piece, however much it may be cut up, and

Compound Leaves, those in which the blade consists of two or more separate pieces, upon a common leaf-stalk or support. Yet between these two kinds every intermediate gradation is to be met with.

139. **As to Particular Outlines of Simple Leaves** (and the same applies to their separate parts), they are

FIG. 133–141. Forms of the apex of leaves.

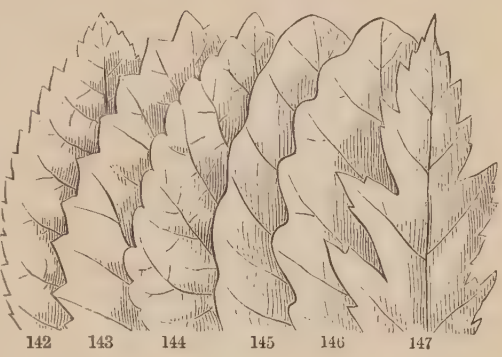
Entire, when their general outline is completely filled out, so that the margin is an even line, without teeth or notches.

Serrate, or *Saw-toothed*, when the margin only is cut into sharp teeth, like those of a saw, and pointing forwards: as in Fig. 142.

Dentate, or *Toothed*, when such teeth point outwards, instead of forwards; as in Fig 143.

Crenate, or *Scalloped*, when the teeth are broad and rounded; as in Fig. 144.

Repand, *Undulate*, or *Wavy*, when the margin of the leaf forms a wavy line, bending slightly inwards and outwards in succession; as in Fig. 145.


142 143 144 145 146 147

Sinuate, when the margin is more strongly sinuous or turned inwards and outwards; as in Fig. 146.

Incised, *Cut*, or *Jagged*, when the margin is cut into sharp, deep, and irregular teeth or incisions; as in Fig. 147.

Lobed, when deeply cut. Then the pieces are in a general way called Lobes. The number of the lobes is briefly expressed by the phrase *two-lobed*, *three-lobed*, *five-lobed*, *many-lobed*, etc., as the case may be.

140. When the depth and character of the lobing needs to be more particularly specified, the following terms are employed, viz.: —

Lobed, in a special sense, when the incisions do not extend deeper than about half-way between the margin and the centre of the blade, if so far, and are more or less rounded; as in the leaves of the Post-Oak, Fig. 148, and the Hepatica, Fig. 152.

Cleft, when the incisions extend half way down or more, and especially when they are sharp; as in Fig. 149, 153. And the phrases *two-cleft*, or, in the Latin form, *bifid*, *three-cleft* or *trifid*, *four-cleft* or *quadrifid*, *five-cleft* or *quinquefid*, etc., or *many-cleft*, in the Latin form, *multifid*, — express the number of the *Segments*, or portions.

Parted, when the incisions are still deeper, but yet do not quite reach to the midrib or the base of the blade; as in Fig. 150, 154. And the terms *two-parted*, *three-parted*, etc., express the number of such divisions.

Divided, when the incisions extend quite to the midrib, as in the lower part of Fig. 151, or to the leaf-stalk, as in Fig. 155; which really makes the

Fig. 142–147. Kinds of margin of leaves.

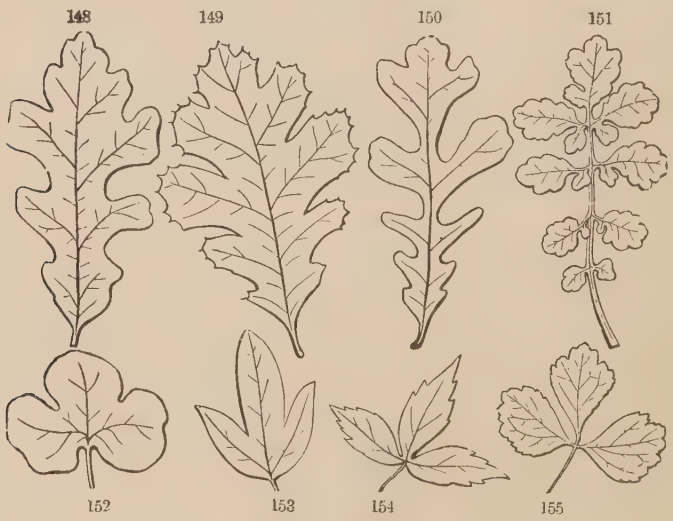
leaf compound. Here, using the Latin form, the leaf is said to be *bisected*, *trisected* (Fig. 155), etc., according to the number of the divisions.

141. **The Mode of Lobing or Division** corresponds to that of the veining, whether *pinnately veined* or *palmately veined*. In the former the notches or incisions, or *sinuses*, coming between the principal veins or ribs are directed toward the midrib: in the latter they are directed toward the apex of the petiole; as the figures show.

142. So degree and mode of division may be tersely expressed in brief phrases. Thus, in the four upper figures of pinnately veined leaves, the first is said to be *pinnately lobed* (in the special sense), the second *pinnately cleft* (or *pinnatifid* in Latin form), the third *pinnately parted*, the fourth *pinnately divided*, or *pinnatisected*.

143. Correspondingly in the lower row, of palmately veined leaves, the first is *palmately lobed*, the second *palmately cleft*, the third *palmately parted*, the fourth *palmately divided*. Or, in other language of the same meaning (but now less commonly employed), they are said to be *digitately lobed, cleft, parted,* or *divided*.

144. The number of the divisions or lobes may come into the phrase. Thus in the four last named figures the leaves are respectively *palmately*



three-lobed, *three-cleft* (or *trifid*), *three-parted*, *three-divided*, or better (in Latin form), *trisected*. And so for higher numbers, as *five-lobed*, *five-cleft*,

FIG. 148, pinnately lobed; 149, pinnately cleft; 150, pinnately parted; 151, pinnately divided, leaves.

FIG. 152, palmately three-lobed; 153, palmately three-cleft; 154, palmately three-parted; 155, palmately three-divided or trisected, leaves

etc., up to *many-lobed, many-cleft* or *multifid*, etc. The same mode of expression may be used for pinnately lobed leaves, as *pinnately 7-lobed, -cleft, -parted,* etc.

145. The divisions, lobes, etc., may themselves be *entire* (without teeth or notches), or *serrate,* or otherwise toothed or incised; or lobed, cleft, parted, etc.: in the latter cases making *twice pinnatifid, twice palmately* or *pinnately lobed, parted,* or *divided* leaves, etc. From these illustrations one will perceive how the botanist, in two or three words, may describe any one of the almost endlessly diversified shapes of leaves, so as to give a clear and definite idea of it.

146. **Compound Leaves.** A compound leaf is one which has its blade in entirely separate parts, each usually with a stalklet of its own; and the stalklet is often *jointed* (or *articulated*) with the main leaf-stalk, just as this

156 157 158

is jointed with the stem. When this is the case, there is no doubt that the leaf is compound. But when the pieces have no stalklets, and are not jointed with the main leaf-stalk, it may be considered either as a divided simple leaf, or a compound leaf, according to the circumstances. This is a matter of names where all intermediate forms may be expected.

147. While the pieces or projecting parts of a simple leaf-blade are called *Lobes,* or in deeply cut leaves, etc., *Segments,* or *Divisions,* the separate pieces or blades of a compound leaf are called LEAFLETS.

148. Compound leaves are of two principal kinds, namely, the *Pinnate* and the *Palmate;* answering to the two modes of veining in reticulated leaves, and to the two sorts of lobed or divided leaves (141).

149. *Pinnate* leaves are those in which the leaflets are arranged on the sides of a main leaf-stalk; as in Fig. 156–158. They answer to the

FIG. 156–158. Pinnate leaves, the first with an odd leaflet (*odd-pinnate*); the second with a tendril in place of uppermost leaflets; the third *abruptly pinnate,* or of even pairs.

feather-veined (i. e. *pinnately-veined*) simple leaf; as will be seen at once on comparing the forms. The *leaflets* of the former answer to the *lobes* or *divisions* of the latter; and the continuation of the petiole, along which the leaflets are arranged, answers to the midrib of the simple leaf.

150. Three sorts of pinnate leaves are here given. Fig. 156 is *pinnate with an odd* or *end leaflet*, as in the Common Locust and the Ash. Fig. 157 is *pinnate with a tendril at the end*, in place of the odd leaflet, as in the Vetches and the Pea. Fig. 158 is evenly or *abruptly pinnate*, as in the Honey-Locust.

151. *Palmate* (also named *Digitate*) leaves are those in which the leaflets are all borne on the tip of the leaf-stalk, as in the Lupine, the Common Clover, the Virginia Creeper (Fig. 93), and the Horse-chestnut and Buckeye (Fig. 159). They evidently answer to the *radiate-veined* or *palmately-veined* simple leaf. That is, the Clover-leaf of three leaflets is the same as a palmately three-ribbed leaf cut into three separate leaflets. And such a simple five-lobed leaf as that of the Sugar-Maple, if more cut, so as to separate the parts, would produce a palmate leaf of five leaflets, like that of the Horse-chestnut or Buckeye.

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152. Either sort of compound leaf may have any number of leaflets; yet palmate leaves cannot well have a great many, since they are all crowded together on the end of the main leaf-stalk. Some Lupines have nine or eleven; the Horse-chestnut has seven, the Sweet Buckeye more commonly five, the Clover three. A pinnate leaf often has only seven or five leaflets, or only three, as in Beans of the genus Phascolus, etc.; in some rarer cases only two; in the Orange and Lemon and also in the common Barberry there is only one! The joint at the place where the leaflet is united with the petiole distinguishes this last case from a simple leaf. In other species of these genera the lateral leaflets also are present.

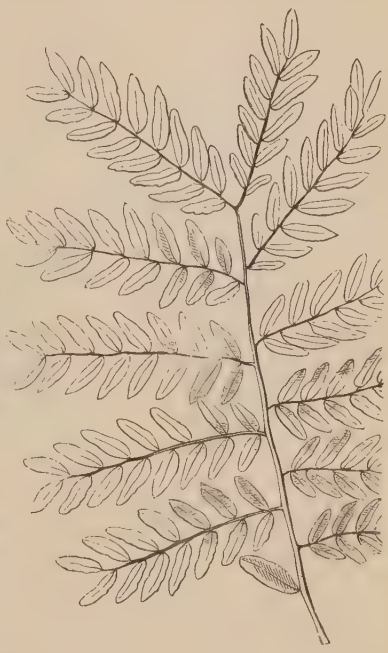
153. The leaflets of a compound leaf may be either *entire* (as in Fig. 126–128), or *serrate*, or lobed, cleft, parted, etc.; in fact, may present all the variations of simple leaves, and the same terms equally apply to them.

154. When the division is carried so far as to separate what would be one leaflet into two, three, or several, the leaf becomes *doubly* or *twice compound*, either *pinnately* or *palmately*, as the case may be. For example, while the clustered leaves of the Honey-Locust are *simply pinnate*, that is, *once pinnate*, those on new shoots are *bipinnate*, or *twice pinnate*, as in Fig. 160. When these leaflets are again divided in the same way, the leaf

FIG. 159. Palmate (or digitate) leaf of five leaflets of the Sweet Buckeye.

becomes *thrice pinnate*, or *tripinnate*, as in many Acacias. The first divisions are called *Pinnæ*; the others, *Pinnules*; and the last, or little blades themselves, *Leaflets*.

155. So the palmate leaf, if again compounded in the same way, becomes *twice palmate*, or, as we say when the divisions are in threes, *twice ternate* (in Latin form *biternate*); if a third time compounded, *thrice ternate* or *triternate*. But if the division goes still further, or if the degree is variable, we simply say that the leaf is *decompound*; either palmately or pinnately decompound, as the case may be. Thus, Fig. 161 represents a four times ternately compound (in other words a *ternately decompound*) leaf of a common Meadow Rue.



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156. When the botanist, in describing leaves, wishes to express the number of the leaflets, he may use terms like these: —

Unifoliolate, for a compound leaf of a single leaflet; from the Latin *unum*, one, and *foliolum*, leaflet.

Bifoliolate, of two leaflets, from the Latin *bis*, twice, and *foliolum*, leaflet.

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Trifoliolate (or *ternate*), of three leaflets, as the Clover; and so on.

Palmately bifoliolate, trifoliolate, quadrifoliate, plurifoliolate (of several leaflets); etc.: or else

Pinnately bi-, tri-, quadri-, or *plurifoliolate* (that is, of two, three, four, five, or several leaflets), as the case may be: these are terse ways of denoting in single phrases both the number of leaflets and the kind of compounding.

157. Of foliage-leaves having certain peculiarities in structure, the following may be noted: —

FIG. 160. A twice-pinnate (abruptly) leaf of the Honey-Locust.
FIG. 161. Ternately decompound leaf of Meadow Rue

158. **Perfoliate Leaves.** In these the stem that bears them seems to run through the blade of the leaf, more or less above its base. A common

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Bellwort (Uvularia perfoliata, Fig. 162) is a familiar illustration. The lower and earlier leaves show it distinctly. Later, the plant is apt to produce some leaves merely clasping the stem by the sessile and heart-shaped base, and the latest may be merely sessile. So the series explains the peculiarity: in the formation of the leaf the bases, meeting around the stem, grow together there.

159. **Connate-perfoliate.** Such are the upper leaves of true Honeysuckles. Here (Fig. 163) of the opposite and sessile leaves, some pairs, especially the uppermost, in the course of their formation unite around the stem, which thus seems to run through the disk formed by their union.

160. **Equitant Leaves.** While ordinary leaves spread horizontally, and present one face to the sky and the other to the earth, there are some that present their tip to the sky, and their faces right and left to the horizon. Among these are the *equitant* leaves of the Iris or Flower-de-Luce. Inspection shows that each leaf was formed as if *folded together lengthwise*,

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Fig. 162. A summer branch of Uvularia perfoliata; lower leaves perfoliate, upper cordate-clasping, uppermost simply sessile.

Fig. 163. Branch of a Honeysuckle, with connate-perfoliate leaves.

Fig. 164. Rootstock and equitant leaves of Iris. 165. A section across the cluster of leaves at the bottom, showing the equitation.

so that what would be the upper surface is within, and all grown together, except next the bottom, where each leaf covers the next younger one. It was from their straddling over each other, like a man on horseback (as is seen in the cross-section, Fig. 165), that Linnæus, with his lively fancy, called these *Equitant* leaves.

161. **Leaves with no distinction of Petiole and Blade.** The leaves of Iris just mentioned show one form of this. The flat but narrow leaves of Jonquils, Daffodils, and the cylindrical leaf of Onions are other instances. *Needle-shaped* leaves, like those of the Pine, Larch, and Spruce, and the *awl-shaped* as well as the *scale-shaped* leaves of Junipers, Red Cedar, and Arbor-Vitæ (Fig. 166), are examples.

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162. **Phyllodia.** Sometimes an expanded *petiole* takes the place of the blade; as in numerous New Holland Acacias, some of which are now common in greenhouses. Such counterfeit blades are called *phyllodia*, — meaning leaf-like bodies. They may be known from true blades by their standing edgewise, their margins being directed upwards and downwards; while in true blades the faces look upwards and downwards; excepting in equitant leaves, as already explained.

163. **Falsely Vertical Leaves.** These are apparent exceptions to the rule, the blade standing edgewise instead of flatwise to the stem; but this position comes by a twist of the stalk or the base of the blade. Such leaves present the two faces about equally to the light. The Compass-plant (Silphium laciniatum) is an example. So also the leaves of Boltonia, of Wild Lettuce, and of a vast number of Australian Myrtaceous shrubs and trees, which much resemble the phyllodia of the Acacias of the same country. They are familiar in Callistemon, the Bottle-brush Flower, and in Eucalyptus. But in the latter the leaves of the young tree have the normal structure and position.

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164. **Cladophylla,** meaning *branch-leaves.* The foliage of Ruscus (the Butcher's Broom of Europe) and of Myrsiphyllum of South Africa (cultivated for decoration under the false

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Fig. 166. Branch of Arbor-Vitæ, with awl-shaped and scale-shaped leaves.
Fig. 167. The ambiguous leaf? (cladophyllum) of Myrsiphyllum.
Fig. 168. Same of Ruscus, or Butcher's Broom.

name of Smilax) is peculiar and puzzling. If these blades (Fig 167, 168) are really leaves, they are most anomalous in occupying the axil of another leaf, reduced to a little scale. Yet they have an upper and lower face, as leaves should, although they soon twist, so as to stand more or less edgewise. If they are branches which have assumed exactly the form and office of leaves, they are equally extraordinary in not making any further development. But in Ruscus, flowers are borne on one face, in the axil of a little scale: and this would seem to settle that they are branches. In Asparagus just the same things as to position are thread-shaped and branch-like.

§ 2. LEAVES OF SPECIAL CONFORMATION AND USE.

165. **Leaves for Storage.** A leaf may at the same time serve both ordinary and special uses. Thus in those leaves of Lilies, such as the common White Lily, which spring from the bulb, the upper and green part serves for foliage and elaborates nourishment, while the thickened portion or bud-scale beneath serves for the storage of this nourishment. The thread-shaped leaf of the Onion fulfils the same office, and the nourishing matter it prepares is deposited in its sheathing base, forming one of the concentric layers of the onion. When these layers, so thick and succulent, have given up their store to the growing parts within, they are left as thin and dry husks. In a Houseleek, an Aloe or an Agave, the green color of the surface of the fleshy leaf indicates that it is doing the work of foliage; the deeper-seated white portion within is the storehouse of the nourishment which the green surface has elaborated. So, also, the seed-leaves or cotyledons are commonly used for storage. Some, as in one of the Maples, the Pea, Horse-chestnut, Oak, etc., are for nothing else. Others, as in Beech and in our common

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FIG. 169. A young Agave Americana, or Century-plant: fleshy-leaved.

Beans, give faint indications of service as foliage also, chiefly in vain. Still others, as in the Pumpkin and Flax, having served for storage, develop into the first efficient foliage. Compare **11, 22–30**, and the accompanying figures

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166. **Leaves as Bud-Scales** serve to protect the forming parts within. Having fulfilled this purpose they commonly fall off when the shoot develops and foliage-leaves appear. Occasionally, as in Fig. 170, there is a transition of bud-scales to leaves, which reveals the nature of the former. The Lilac also shows a gradation from bud-scale to simple leaf. In Cornus florida (the Flowering Dogwood), the four bud-scales which through the winter protect the head of forming flowers remain until blossoming, and then the base of each grows out into

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FIG. 170. Series of bud-scales and foliage-leaves from a developing bud of the Low Sweet Buckeye (Æsculus parviflora), showing nearly complete gradation, from a scale to a compound leaf of five leaflets; and that the scales answer to reduced petioles.

FIG. 171. Shoot of common Barberry, showing transition of foliage-leaves to spines.

a large and very showy petal-like leaf; the original dry scale is apparent in the notch at the apex.

167. **Leaves as Spines** occur in several plants. A familiar instance is that of the common Barberry (Fig. 171). In almost any summer shoot, most of the gradations may be seen between the ordinary leaves, with sharp bristly teeth, and leaves which are reduced to a branching spine or thorn. The fact that the spines of the Barberry produce a leaf-bud in their axil also proves them to be leaves.

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168. **Leaves for Climbing** are various in adaptation. True foliage leaves serve this purpose; as in Gloriosa, where the attenuated tip of a simple leaf (otherwise like that of a Lily) hooks around a supporting object; or in Solanum jasminoides of the gardens (Fig. 172), and in Maurándia, etc., where the leaf-stalk coils round and clings to a support; or in the compound leaves of Clematis and of Adlumia, in which both the leaflets and their stalks hook or coil around the support.

169. Or in a compound leaf, as in the Pea and most Vetches, and in Cobæa, while the lower leaflets serve for foliage, some of the uppermost are developed as tendrils for climbing (Fig. 167). In the common Pea this is so with all but one or two pairs of leaflets.

170. In one European Vetch, the leaflets are wanting and the whole petiole is a tendril, while the stipules become the only foliage (Fig. 173).

171. **Leaves as Pitchers**, or hollow tubes, are familiar in the common Pitcher-plant or Side-saddle Flower (Sarracenia, Fig. 174) of our bogs. These pitchers are generally half full of water, in which flies and other insects are drowned, often in such numbers as to make a rich manure for the plant. More curious are some of the southern species of Sarracenia, which seem to be specially adapted to the capture and destruction of flies and other insects.

Fig. 172. Leaves of Solanum jasminoides, the petiole adapted for climbing.

Fig. 173. Leaf of Lathyrus Aphaca, consisting of a pair of stipules and a tendril.

172. The leaf of Nepenthes (Fig. 175) combines three structures and uses. The expanded part below is foliage: this tapers into a tendril for

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climbing; and this bears a pitcher with a lid. Insects are caught, and perhaps digested, in the pitcher.

173. **Leaves as Fly-traps.** Insects are caught in another way, and more expertly, by the most extraordinary of all the plants of this country, the Dionæa or Venus's Fly-trap, which grows in the sandy bogs around Wilmington, North Carolina. Here (Fig. 176) each leaf bears at its summit an appendage which opens and shuts, in shape something like a steel-trap, and operating much like one. For when open, no sooner does a fly alight on its surface, and brush against any one of the two or three bristles that grow there, than the trap suddenly closes, capturing the intruder. If the fly escapes, the trap soon slowly opens, and is ready for another capture. When retained, the insect is after a time moistened by a secretion from minute glands of the inner surface, and is digested. In the various species of Drosera or Sundew, insects are caught

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FIG. 174. Leaf of Sarracenia purpurea, entire, and another with the upper part cut off.

FIG. 175. Leaf of Nepenthes; foliage, tendril, and pitcher combined.

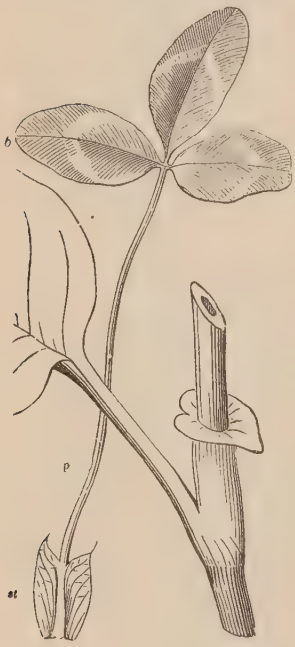
FIG. 176. Leaves of Dionæa; the trap in one of them open, in the others closed.

by sticking fast to very viscid glands at the tip of strong bristles, aided by adjacent gland-tipped bristles which bend slowly toward the captive. The use of such adaptations and operations may be explained in another place.

§ 3. STIPULES.

174. A leaf complete in its parts consists of blade, leaf-stalk or petiole, and a pair of stipules. But most leaves have either fugacious or minute stipules or none at all; many have no petiole (the blade being *sessile* or stalkless); some have no clear distinction of blade and petiole; and many of these, such as those of the Onion and all phyllodia (166), consist of petiole only.

175. The base of the petiole is apt to be broadened and flattened, sometimes into thin margins, sometimes into a sheath which embraces the stem at the point of attachment.



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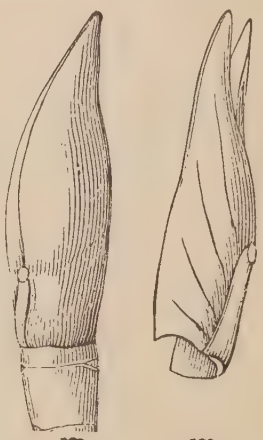

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176. Stipules are such appendages, either wholly or partly separated from the petiole. When quite separate they are said to be *free*, as in Fig. 112. When attached to the base of the petiole, as in the Rose and in

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Fig. 177. Leaf of Red Clover: *st*, stipules, adhering to the base of *p*, the petiole; *b*, blade of three leaflets.

Fig. 178. Part of stem and leaf of Prince's-Feather (Polygonum orientale) with the united sheathing stipules forming a sheath or *ocrea*.

Fig. 179. Terminal winter bud of Magnolia Umbrella, natural size. 180. Outermost bud-scale (pair of stipules) detached.

Clover (Fig. 177), they are *adnate*. When the two stipules unite and sheathe the stem above the insertion, as in Polygonum (Fig. 178), this sheath is called an *Ocrea*, from its likeness to a greave or leggin.

177. In Grasses, when the sheathing base of the leaf may answer to petiole, the summit of the sheath commonly projects as a thin and short membrane, like an ocrea: this is called a LIGULA or LIGULE.

178. When stipules are green and leaf-like they act as so much foliage. In the Pea they make up no small part of the actual foliage. In a related plant (Lathyrus Aphaca, Fig. 173), they make the whole of it, the remainder of the leaf being tendril.

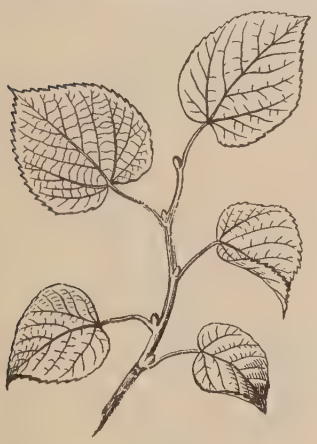
179. In many trees the stipules are the bud-scales, as in the Beech, and very conspicuously in the Fig-tree, Tulip-tree, and Magnolia (Fig. 179). These fall off as the leaves unfold.

180. The stipules are spines or prickles in Locust and several other Leguminous trees and shrubs; they are tendrils in Smilax or Greenbrier

§ 4. THE ARRANGEMENT OF LEAVES.

181. **Phyllotaxy,** meaning leaf-arrangement, is the study of the position of leaves, or parts answering to leaves, upon the stem.

182. The technical name for the attachment of leaves to the stem is



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the *insertion*. Leaves (as already noticed, 54) are *inserted* in three modes. They are

Alternate (Fig. 181), that is, one after another, or in other words, with only a single leaf to each node;

FIG. 181. Alternate leaves, in Linden, Lime-tree, or Basswood.
FIG. 182. Opposite leaves, in Red Maple.

Opposite (Fig. 182), when there is a pair to each node, the two leaves in this case being always on opposite sides of the stem;

Whorled or *Verticillate* (Fig. 183) when there are more than two leaves on a node, in which case they divide the circle equally between them, forming a *Verticel* or whorl. When there are three leaves in the whorl, the leaves are one third of the circumference apart; when four, one quarter, and so on. So the plan of opposite leaves, which is very common, is merely that of whorled leaves, with the fewest leaves to the whorl, namely, two.

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183. In both modes and in all their modifications, the arrangement is such as to distribute the leaves systematically and in a way to give them a good exposure to the light.

184. No two or more leaves ever grow from the same point. The so-called *Fascicled* or *Clustered* leaves are the leaves of a branch the nodes of which are very close, just as they are in the bud, so keeping the leaves in a cluster. This is evident in the Larch (Fig. 184), in which examination shows each cluster to be made up of numerous leaves crowded on a spur or short axis. In spring there are only such clusters; but in summer some of them lengthen into ordinary shoots with scattered alternate leaves. So, likewise, each cluster of two or three needle-shaped leaves in Pitch Pines (as in Fig. 185), or of five leaves in White Pine, answers to a similar extremely short branch, springing from the axil of a thin and slender scale, which represents a leaf of the main shoot. For Pines produce two kinds of leaves, — 1. primary, the proper leaves of the shoots, not as foliage, but in the shape of delicate scales in spring, which soon fall away; and 2. secondary, the *fascicled* leaves, from buds in the axils of the former, and these form the actual foliage.

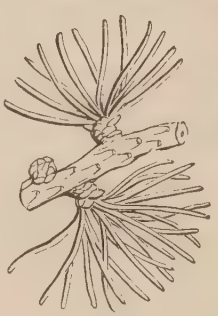

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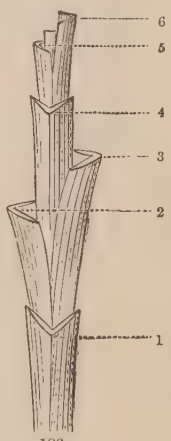
Fig. 183. Whorled leaves of Galium.

Fig. 184. A piece of stem of Larch with two clusters (fascicles) of numerous leaves.

Fig. 185. Piece of a branch of Pitch Pine, with three leaves in a fascicle or bundle, in the axil of a thin scale which answers to a primary leaf. The bundle is surrounded at the base by a short sheath, formed of the delicate scales of the axillary bud.

185. **Phyllotaxy of Alternate Leaves.** Alternate leaves are distributed along the stem in an order which is uniform for each species. The arrangement in all its modifications is said to be *spiral*, because, if we draw a line from the *insertion* (i. e. the point of attachment) of one leaf to that of the next, and so on, this line will wind spirally around the stem as it rises, and in the same species will always bear the same number of leaves for each turn round the stem. That is, any two successive leaves will always be separated from each other by an equal portion of the circumference of the stem. The distance in *height* between any two leaves may vary greatly, even on the same shoot, for that depends upon the length of the *internodes*, or spaces between the leaves; but the distance as measured around the circumference (in other words, the *Angular Divergence*, or angle formed by any two successive leaves) is uniformly the same.

186. **Two-ranked.** The greatest possible divergence is, of course, where the second leaf stands on exactly the opposite side of the stem from the first, the third on the side opposite the second, and therefore over the first, and the fourth over the second. This brings all the leaves into two ranks, one on one side of the stem and one on the other, and is therefore called the *Two-ranked* arrangement. It occurs in all Grasses, — in Indian Corn, for instance; also, in the Basswood (Fig. 181). This is the simplest of all arrangements, and the one which most widely distributes successive leaves, but which therefore gives the fewest vertical ranks. Next is the



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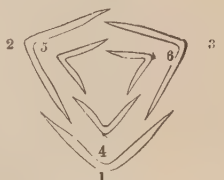
187. **Three-ranked** arrangement, — that of all Sedges, and of White Hellebore. Here the second leaf is placed one third of the way round the stem, the third leaf two thirds of the way round, the fourth leaf accordingly directly over the first, the fifth over the second, and so on. That is, three leaves occur in each turn round the stem, and they are separated from each other by one third of the circumference. (Fig. 186, 187.)



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188. **Five-ranked** is the next in the series, and the most common. It is seen in the Apple (Fig. 188), Cherry, Poplar, and the greater number of trees and shrubs. In this case the line traced from leaf to leaf will pass twice round the stem before it reaches a leaf

FIG. 186. Three-ranked arrangement, shown in a piece of the stalk of a Sedge, with the leaves cut off above their bases; the leaves are numbered in order, from 1 to 6. 187. Diagram or cross-section of the same, in one plane; the leaves similarly numbered; showing two cycles of three.

situated directly over any below (Fig. 189). Here the sixth leaf is over the first; the leaves stand in five perpendicular ranks, with equal angular distance from each other; and this distance between any two successive leaves is just two fifths of the circumference of the stem.

189. The five-ranked arrangement is expressed by the fraction $\frac{2}{5}$. This fraction denotes the divergence of the successive leaves, i. e. the angle they form with each other: the numerator also expresses the number of turns made round the stem by the spiral line in completing one cycle or set of leaves, namely, two; and the denominator gives the number of leaves in each cycle, or the number of perpendicular ranks, namely, five. In the same way the fraction $\frac{1}{2}$ stands for the two-ranked mode, and $\frac{1}{3}$ for the three-ranked: and so these different sorts are expressed by the series of fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{5}$. Other cases follow in the same numerical progression, the next being the

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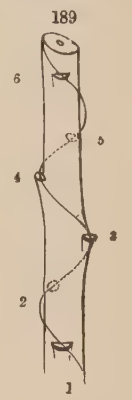

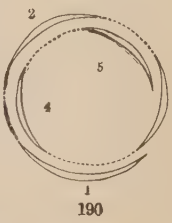

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190. Eight-ranked arrangement. In this the ninth leaf stands over the first, and three turns are made around the stem to reach it; so it is expressed by the fraction $\frac{3}{8}$. This is seen in the Holly, and in the common Plantain. Then comes the

191. Thirteen-ranked arrangement, in which the fourteenth leaf is over the first, after five turns around the stem. The common Houseleek (Fig. 191) is a good example.

192. The series so far, then, is $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{5}$, $\frac{3}{8}$, $\frac{5}{13}$; the numerator and the denominator of each fraction being those of the two next preceding ones added together. At this rate the next higher should be $\frac{8}{21}$, then $\frac{13}{34}$, and so on; and in fact just such cases are met with, and (commonly) no others. These higher sorts are found in the Pine Family, both in the leaves and the cones and in many other plants with small and crowded leaves. But in those the number of the ranks, or of leaves in each cycle, can only rarely

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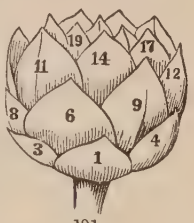
FIG. 188. Shoot with its leaves 5-ranked, the sixth leaf over the first; as in the Apple-tree.

FIG. 189. Diagram of this arrangement, with a spiral line drawn from the attachment of one leaf to the next, and so on; the parts on the side turned from the eye are fainter.

FIG. 190. A ground-plan of the same; the section of the leaves similarly numbered; a dotted line drawn from the edge of one leaf to that of the next marks out the spiral.

be made out by direct inspection. They may be indirectly ascertained, however, by studying the *secondary* spirals, as they are called, which usually become conspicuous, at least two series of them, one turning to the right and one to the left, as shown in Fig. 191. For an account of the way in which the character of the phyllotaxy may be deduced from the secondary spirals, see Structural Botany, Chapter IV.



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193. **Phyllotaxy of Opposite and whorled Leaves.** This is simple and comparatively uniform. The leaves of each pair or whorl are placed over the intervals between those of the preceding, and therefore under the intervals of the pair or whorl next above. The whorls or pairs alternate or cross each other, usually at right angles, that is, they *decussate*. Opposite leaves, that is, whorls of two leaves only, are far commoner than whorls of three or four or more members. This arrangement in successive decussating pairs gives an advantageous distribution on the stem in four vertical ranks. Whorls of three give six vertical ranks, and so on. Note that in descriptive botany leaves in whorls of two are simply called *opposite* leaves; and that the term *verticillate* or *whorled*, is employed only for cases of more than two, unless the latter number is specified.

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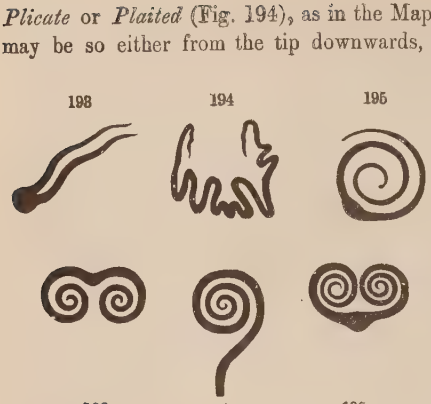
194. **Vernation or Præfoliation**, the disposition of the leaf-blades in the bud, comprises two things; 1st, the way in which each separate leaf is folded, coiled, or packed up in the bud; and 2d, the arrangement of the leaves in the bud with respect to one another. The latter of course depends very much upon the phyllotaxy, i. e. the position and order of the leaves upon the stem. The same terms are used for it as for the arrangement of the leaves of the flower in the flower-bud. See, therefore, "Æstivation, or Præfloration."

195. As to each leaf separately, it is sometimes *straight* and open in vernation, but more commonly it is either *bent, folded,* or *rolled up*. When the upper part is bent down upon the lower, as the young blade in the Tulip-tree is bent upon the leafstalk, it is said to be *Inflexed* or *Reclined* in vernation. When folded by the midrib so that the two halves are placed face to face, it is *Conduplicate* (Fig. 193), as in the Magnolia, the Cherry, and the Oak. When folded back and forth like the plaits of a fan, it is

FIG. 191. A young plant of the Houseleek, with the leaves (not yet expanded) numbered, and exhibiting the 13-ranked arrangement; and showing secondary spirals.

FIG. 192. Opposite leaves of Euonymus, or Spindle-tree, showing the successive pairs crossing each other at right angles.

Plicate or *Plaited* (Fig. 194), as in the Maple and Currant. If rolled, it may be so either from the tip downwards, as in Ferns and the Sundew (Fig. 197), when in unrolling it resembles the head of a crosier, and is said to be *Circinate;* or it may be rolled up parallel with the axis, either from one edge into a coil, when it is *Convolute* (Fig. 195), as in the Apricot and Plum; or rolled from both edges towards the midrib, — sometimes inwards, when it is *Involute* (Fig. 198), as in the Violet and Water-Lily; sometimes outwards, when it is *Revolute* (Fig. 196), in the Rosemary and Azalea. The figures are diagrams, representing sections through the leaf, in the way they were represented by Linnæus.



Section VIII. FLOWERS.

196. Flowers are for the production of seed (16). Stems and branches, which for a time put forth leaves for vegetation, may at length put forth flowers for reproduction.

§ 1. POSITION AND ARRANGEMENT OF FLOWERS, OR INFLORESCENCE.

197. Flower-buds appear just where leaf-buds appear; that is, they are either *terminal* or *axillary* (47–49). Morphologically, flowers answer to shoots or branches, and their parts to leaves.

198. In the same species the flowers are usually from axillary buds only, or from terminal buds only; but in some they are both axillary and terminal.

199. **Inflorescence**, which is the name used by Linnæus to signify mode of flower-arrangement, is accordingly of three classes: namely, *Indeterminate*, when the flowers are in the axils of leaves, that is, are from axillary buds; *Determinate*, when they are from terminal buds, and so *terminate* a stem or branch; and *Mixed*, when these two are combined.

200. **Indeterminate Inflorescence** (likewise, and for the same reason, called *indefinite inflorescence*) is so named because, as the flowers all come from axillary buds, the terminal bud may keep on growing and prolong the stem indefinitely. This is so in Moneywort (Fig. 199).

201. When flowers thus arise singly from the axils of ordinary leaves, they are *axillary* and *solitary*, not collected into flower-clusters.

202. But when several or many flowers are produced near each other, the accompanying leaves are apt to be of smaller size, or of different shape or character: then they are called Bracts, and the flowers thus brought together form a cluster. The kinds of flower-clusters of the indeterminate class have received distinct names, according to their form and disposition. They are principally *Raceme, Corymb, Umbel, Spike, Head, Spadix, Catkin,* and *Panicle.*

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203. In defining these it will be necessary to use some of the following terms of descriptive botany which relate to inflorescence. If a flower is stalkless, i. e. sits directly in the axil or other support, it is said to be *sessile.* If raised on a naked stalk of its own (as in Fig. 199) it is *pedunculate,* and the stalk is a Peduncle.

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204. A peduncle on which a flower-cluster is raised is a *Common peduncle.* That which supports each separate flower of the cluster is a *Partial peduncle,* and is generally called a Pedicel. The portion of the general stalk along which flowers are disposed is called the *Axis of inflorescence,* or, when covered with sessile flowers, the *Rhachis* (back-bone), and sometimes the *Receptacle.* The leaves of a flower-cluster generally are termed Bracts. But when bracts of different orders are to be distinguished, those on the common peduncle or axis, and which have a flower in their axil, keep the name of *bracts;* and those on the pedicels or partial flower-stalks, if any, that of Bractlets or *Bracteoles.* The former is the preferable English name.

205. **A Raceme** (Fig. 200) is that form of flower-cluster in which the flowers, each on their own foot-stalk or pedicel, are arranged along the sides of a common stalk or axis of inflorescence; as in the Lily of the Valley, Currant, Barberry, one section of Cherry, etc. Each flower comes from the axil of a small leaf, or bract, which, however, is often so small that it might escape notice, and even sometimes (as in the Mustard Family) disappears altogether. The lowest blossoms of a

Fig. 199. Piece of a flowering-stem of Moneywort (Lysimachia nummularia,) with single flowers successively produced in the axils of the leaves, from below upwards, as the stem grows on.

Fig. 200. A raceme, with a general peduncle (*p*), pedicels (*p'*), bracts (*b*), and bractlets (*b'*). Plainly the bracts here answer to the leaves in Fig. 199

raceme are of course the oldest, and therefore open first, and the order of blossoming is *ascending* from the bottom to the top. The summit, never being stopped by a terminal flower, may go on to grow, and often does so (as in the common Shepherd's Purse), producing lateral flowers one after another for many weeks.

206. **A Corymb** (Fig. 202) is the same as a raceme, except that it is flat and broad, either convex, or level-topped. That is, a raceme becomes a corymb by lengthening the lower pedicels while the uppermost remain

201 202 203

shorter. The axis of a corymb is short in proportion to the lower pedicels By extreme shortening of the axis the corymb may be converted into

207. **An Umbel** (Fig. 203) as in the Milkweed, a sort of flower-cluster where the pedicels all spring apparently from the same point, from the top of the peduncle, so as to resemble, when spreading, the rays of an umbrella; whence the name. Here the pedicels are sometimes called the *Rays* of the umbel. And the bracts, when brought in this way into a cluster or circle, form what is called an INVOLUCRE.

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208. The corymb and the umbel being more or less level-topped, bringing the flowers into a horizontal plane or a convex form, the ascending order of development appears as *Centripetal*. That is, the flowering proceeds from the margin or circumference regularly towards the centre; the lower flowers of the former answering to the outer ones of the latter.

209. In these three kinds of flower-clusters, the flowers are raised on conspicuous *pedicels* (204) or stalks of their own. The shortening of these pedicels, so as to render the flowers *sessile* or nearly so, converts a raceme into a *Spike*, and a corymb or an umbel into a *Head*.

210. **A Spike** is a flower-cluster with a more or less lengthened axis, along which the flowers are sessile or nearly so; as in the Plantain (Fig. 204).

211. **A Head** (*Capitulum*) is a round or roundish cluster of flowers,

FIG. 201. A raceme. 202. A corymb. 203. An umbel.
FIG. 204. Spike of the common Plantain or Ribwort.

which are sessile on a very short axis or receptacle, as in the Button-ball, Button-bush (Fig. 205), and Red Clover. It is just what a spike would

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become if its axis were shortened; or an umbel, if its pedicels were all shortened until the flowers became sessile. The head of the Button-bush is naked; but that of the Thistle, of the Dandelion, and the like, is surrounded by empty bracts, which form an *Involucre*. Two particular forms of the spike and the head have received particular names, namely, the *Spadix* and the *Catkin*.

212. **A Spadix** is a fleshy spike or head, with small and often imperfect flowers, as in the Calla, Indian Turnip, (Fig. 206), Sweet Flag, etc. It is commonly surrounded or embraced by a peculiar enveloping leaf, called a SPATHE.

213. **A Catkin, or Ament,** is the name given to the scaly sort of spike of the Birch (Fig. 207) and Alder, the Willow and Poplar, and one sort of flower-clusters of the Oak, Hickory, and the like, — the so-called *Amentaceous* trees.

214. *Compound* flower-clusters of these kinds are not uncommon. When the stalks which in the simple umbel are the pedicels of single flowers themselves branch into an umbel, a *Compound Umbel* is formed.

207

FIG. 205. Head of the Button-bush (Cephalanthus).

FIG. 206. Spadix and spathe of the Indian Turnip; the latter cut through below.

FIG. 207. Catkin, or Ament, of Birch.

This is the inflorescence of Caraway (Fig. 208), Parsnip, and almost all of the great family of Umbelliferous (umbel-bearing) plants.

208

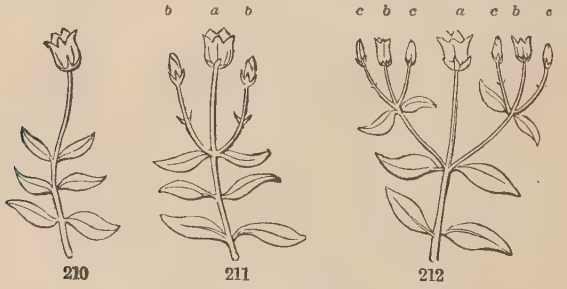
215. The secondary or partial umbels of a compound umbel are UMBELLETS. When the umbellets are subtended by an involucre, this secondary involucre is called an INVOLUCEL.

209

216. A *Compound raceme* is a cluster of racemes racemosely arranged, as in Smilacina racemosa. A *compound corymb* is a corymb some branches of which branch again in the same way, as in Mountain Ash. A *compound spike* is a spicately disposed cluster of spikes.

217. **A Panicle**, such as that of Oats and many Grasses, is a compound flower-cluster of a more or less open sort which branches with apparent irregularity, neither into corymbs nor racemes. Fig. 209 represents the simplest panicle. It is, as it were, a raceme of which some of the pedicels have branched so as to bear a few flowers on pedicels of their own, while others remain simple. A *compound panicle* is one that branches in this way again and again.

218. **Determinate Inflorescence** is that in which the flowers are from terminal buds. The simplest case is that of a solitary terminal flower, as



210 211 212

in Fig. 210. This stops the growth of the stem; for its terminal bud, becoming a blossom, can no more lengthen in the manner of a leaf-bud. Any

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FIG. 208. Compound Umbel of Caraway.

FIG. 209. Diagram of a simple panicle.

FIG. 210. Diagram of an opposite-leaved plant, with a single terminal flower. 211. Same, with a cyme of three flowers; *a*, the first flower, of the main axis: *b b*, those of branches. 212. Same, with flowers also of the third order, *c c*.

further growth must be from axillary buds developing into branches. If such branches are leafy shoots, at length terminated by single blossoms, the inflorescence still consists of solitary flowers at the summit of stem and branches. But if the flowering branches bear only bracts in place of ordinary leaves, the result is the kind of flower-cluster called

219. **A Cyme.** This is commonly a flat-topped or convex flower-cluster, like a corymb, only the blossoms are from terminal buds. Fig. 211 illustrates the simplest cyme in a plant with opposite leaves, namely, with three flowers. The middle flower, *a*, terminates the stem; the two others, *b b*, terminate branches, one from the axil of each of the uppermost leaves; and being later than the middle one, the flowering proceeds from the centre outwards, or is *Centrifugal*. This is the opposite of the indeterminate mode, or that where all the flower-buds are axillary. If flowering branches appear from the axils below, the lower ones are the later, so that the order of blossoming continues *centrifugal* or, which is the same thing, *descending*, as in Fig. 213, making a sort of reversed raceme or *false raceme*,—a kind of cluster which is to the true raceme just what the flat cyme is to the corymb.

213

220. Wherever there are bracts or leaves, buds may be produced from their axils and appear as flowers. Fig. 212 represents the case where the branches, *b b*, of Fig. 211, each with a pair of small leaves or bracts about their middle, have branched again, and produced the branchlets and flowers *c c*, on each side. It is the continued repetition of this which forms the full or compound cyme, such as that of the Laurestinus, Hobble-bush, Dogwood, and Hydrangea (Fig. 214).

221. **A Fascicle** (meaning a bundle), like that of the Sweet William and Lychnis of the gardens, is only a cyme with the flowers much crowded.

222. **A Glomerule** is a cyme still more compacted, so as to imitate a head. It may be known from a true head by the flowers not expanding centripetally, that is, not from the circumference towards the centre.

223. The illustrations of determinate or *cymose* inflorescence have been taken from plants with opposite leaves, which give rise to the most regular cymes. But the Rose, Cinquefoil, Buttercup, etc., with alternate leaves, furnish also good examples of cymose inflorescence.

224. **A Cymule** (or diminutive cyme) is either a reduced small cyme of few flowers, or a branch of a compound cyme, i. e. a partial cyme.

225. **Scorpioid** or **Helicoid Cymes**, of various sorts, are forms of determinate inflorescence (often puzzling to the student) in which one half of the ramification fails to appear. So that they may be called *incomplete cymes*. The commoner forms may be understood by comparing a complete

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FIG. 213. Diagram of a simple cyme in which the axis lengthens, so as to take the form of a raceme.

cyme, like that of Fig. 215 with Fig. 216, the diagram of a cyme of an opposite-leaved plant, having a series of terminal flowers and the axis con-

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tinued by the development of a branch in the axil of only one of the leaves at each node. The dotted lines on the left indicate the place of the wanting

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branches, which if present would convert this *scorpioid cyme* into the complete one of Fig. 215. Fig. 217 is a diagram of similar inflorescence with alternate leaves. Both are kinds of *false racemes* (219). When the bracts are also wanting in such cases, as in many Borragineous plants, the true nature of the inflorescence is very much disguised.

216 217

Fig. 214. Compound cyme of Hydrangea arborescens, with neutral enlarged flowers round the circumference.

Fig. 215. A complete forking cyme of an Arenaria, or Chickweed.

Fig. 216. Diagram of a scorpioid cyme, with opposite leaves or bracts.

Fig. 217. Diagram of analogous scorpioid cyme, with alternate leaves or bracts.

226. These distinctions between determinate and indeterminate inflorescence, between corymbs and cymes, and between the true and the false raceme and spike, were not recognized by botanists much more than half a century ago, and even now are not always attended to in descriptions. It is still usual and convenient to describe rounded or flat-topped and open ramification as *corymbose*, even when essentially cymose; also to call the reversed or false racemes or spikes by these (strictly incorrect) names.

227. **Mixed Inflorescence** is that in which the two plans are mixed or combined in compound clusters. A *mixed panicle* is one in which, while the primary ramification is of the indeterminate order, the secondary or ultimate is wholly or partly of the determinate order. A contracted or elongated inflorescence of this sort is called a THYRSUS. Lilac and Horse-chestnut afford common examples of mixed inflorescence of this sort. When loose and open such flower-clusters are called by the general name of *Panicles*. The heads of Compositæ are centripetal; but the branches or peduncles which bear the heads are usually of centrifugal order.

§ 2. PARTS OR ORGANS OF THE FLOWER.

228. These were simply indicated in Section II. 16. Some parts are necessary to seed-bearing; these are *Essential Organs*, namely, the *Stamens* and *Pistils*. Others serve for protection or for attraction, often for both. Such are the leaves of the Flower, or the *Floral Envelopes*.

229. **The Floral Envelopes**, taken together, are sometimes called the PERIANTH, also *Perigone*, in Latin form *Perigonium*. In a flower which possesses its full number of organs, the floral envelopes are of two kinds, namely, an outer circle, the CALYX, and an inner, the COROLLA.

230. **The Calyx** is commonly a circle of green or greenish leaves, but not always. It may be the most brightly colored part of the blossom. Each calyx-leaf or piece is called a SEPAL.

231. **The Corolla** is the inner circle of floral envelopes or flower-leaves, usually of delicate texture and *colored*, that is, of some other color than green. Each corolla-leaf is called a PETAL.

232. There are flowers in abundance which consist wholly of floral envelopes. Such are the so-called full *double flowers*, of which the choicer roses and camellias of the cultivator are familiar examples. In them, under the gardener's care and selection, petals have taken the place of both stamens and pistils. These are monstrous or unnatural flowers, incapable of producing seed, and subservient only to human gratification. Their common name of *double* flowers is not a sensible one: except that it is fixed by custom, it were better to translate their Latin name, *flores pleni*, and call them *full flowers*, meaning full of leaves.

233. Moreover, certain plants regularly produce *neutral flowers*, consisting of floral envelopes only. In Fig. 214, some are seen around the margin

of the cyme in Hydrangea. They are likewise familiar in the Hobble-bush and in Wild-Cranberry tree, Viburnum Oxycoccus; where they form an attractive setting to the cluster of small and comparatively inconspicuous

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perfect flowers which they adorn. In the Guelder Rose, or Snow-ball of ornamental cultivation, all or most of the blossoms of this same shrub are transformed into neutral flowers.

234. **The Essential Organs** are likewise of two kinds, placed one above or within the other; namely, first, the STAMENS or fertilizing organs, and second, the PISTILS, which are to be fertilized and bear the seeds.

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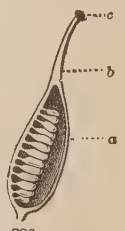

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235. **A Stamen** consists of two parts, namely, the FILAMENT or stalk (Fig. 219 *a*), and the ANTHER (*b*). The latter is the only essential part. It is a case, commonly with two lobes or cells, each opening lengthwise by a slit, at the proper time, and discharging a powder or dust-like substance, usually of a yellow color. This powder is the POLLEN, or fertilizing matter, to produce which is the office of the stamen.

236. **A Pistil** (Fig. 220, 221) when complete, has three parts; OVARY, STYLE, and STIGMA. The *Ovary*, at base, is the hollow portion, which contains one or more OVULES or rudimentary seeds. The *Style* is the tapering

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FIG. 218. A *flos plenus*, namely, a full double flower of Rose.

FIG. 219. A stamen: *a*, filament: *b*, anther, discharging pollen.

FIG. 220. A pistil; with ovary, *a*, half cut away, to show the contained ovules; *b*, style; *c*, stigma.

portion above: the *Stigma* is a portion of the style, usually its tip, with moist naked surface, upon which grains of pollen may lodge and adhere, and thence make a growth which extends down to the ovules. When there is no style then the stigma occupies the tip of the ovary.

221

237. **The Torus** or **Receptacle** is the end of the flower-stalk, or the portion of axis or stem out of which the several organs of the flower grow, upon which they are borne (Fig. 223).

238. The parts of the flower are thus disposed on the receptacle or axis essentially as are leaves upon a very short stem; first the sepals, or outer floral leaves; then the petals or inner floral leaves; then the stamens; lastly, at summit or centre, the pistils, when there are two or more of them, or the single pistil, when only one. Fig. 223 shows the organs displayed, two of each kind, of such a simple and symmetrical flower as that of a Sedum or Stonecrop, Fig. 222.

§ 3. PLAN OF FLOWER.

239. All flowers are formed upon one general plan, but with almost infinite variations, and many disguises. This common plan is best understood by taking for a type, or standard for comparison, some *perfect*, *complete*,

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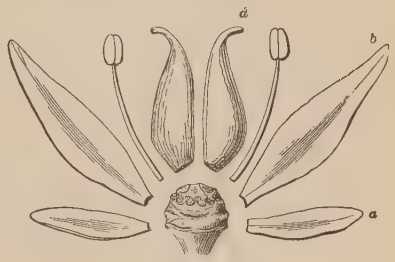

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regular, and *symmetrical* blossom, and one as simple as such a blossom could well be. Flowers are said to be

Perfect (*hermaphrodite*), when provided with both kinds of essential organs, i. e. with both stamens and pistils.

Complete, when, besides, they have the two sets of floral envelopes, namely,

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Fig. 221. Model of a simple pistil, with ovary cut across and slightly opened ventrally, to show the ovules and their attachment.

Fig. 222. Flower of Sedum ternatum, a Stonecrop.

Fig. 223. Parts of same, two of each kind, separated and displayed; the torus or receptacle in the centre; *a*, a sepal; *b*, a petal; *c*, a stamen; *d*, a pistil.

calyx and corolla. Such are completely furnished with all that belongs to a flower.

Regular, when all the parts of each set are alike in shape and size.

Symmetrical, when there is an equal number of parts in each set or circle of organs.

240. Flax-flowers were taken for a pattern in Section II. 16. But in them the five pistils have their ovaries as it were consolidated into one body. Sedum, Fig. 222, has the pistils and all the other parts free from such combination. The flower is perfect, complete, regular, and symmetrical, but is not quite as simple as it might be; for there are twice as many stamens as there are of the other organs. Crassula, a relative of Sedum, cultivated in the conservatories for winter blossoming (Fig. 224) is simpler, being *isostemonous*, or with just as many stamens as petals or sepals, while Sedum is *diplostemonous*, having double that number: it has, indeed, two sets of stamens.

224

225

241. **Numerical Plan.** A certain number either runs through the flower or is discernible in some of its parts. This number is most commonly either five or three, not very rarely four, occasionally two. Thus the *ground-plan* of the flowers thus far used for illustration is five. That of Trillium (Fig. 226, 227) is three, as it likewise is as really, if not as plainly, in Tulips and Lilies, Crocus, Iris, and all that class of blossoms. In some Sedums all the flowers are in fours. In others the first flowers are on the plan of five, the rest mostly on the plan of four, that is, with four sepals, four petals, eight stamens (i. e. twice four), and four pistils. Whatever the ground number may be, it runs through the whole in symmetrical blossoms.

227

226

242. **Alternation of the successive Circles.** In these flowers the parts of the successive circles *alternate*; and such is the rule. That is,

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Fig. 224. Flower of a Crassula. 225. Diagram or ground-plan of same.

Fig. 226. Flower of a Trillium; its parts in threes.

Fig. 227. Diagram of flower of Trillium. In this, as in all such diagrams of cross-section of blossoms, the parts of the outer circle represent the calyx; the next, corolla; within, stamens (here in two circles of three each, and the cross-section is through the anthers); in the centre, section of three ovaries joined into a compound one of three cells

the petals stand over the intervals between the sepals; the stamens, when of the same number, stand over the intervals between the petals; or when twice as many, as in the Trillium, the outer set alternates with the petals, and the inner set, alternating with the other, of course stands before the petals; and the pistils alternate with these. This is just as it should be on the theory that the circles of the blossom answer to whorls of leaves, which alternate in this way. While in such flowers the circles are to be regarded as whorls, in others they are rather to be regarded as condensed spirals of alternate leaves. But, however this may be, in the mind of a morphological botanist,

243. **Flowers are altered Branches**, and their parts, therefore, altered leaves. That is, certain buds, which might have grown and lengthened into a leafy branch, do, under other circumstances and to accomplish other purposes, develop into blossoms. In these the axis remains short, nearly as it is in the bud; the leaves therefore remain close together in sets or circles; the outer ones, those of the calyx, generally partake more or less of the character of foliage; the next set are more delicate, and form the corolla, while the rest, the stamens and pistils, appear under forms very different from those of ordinary leaves, and are concerned in the production of seed. This view gives to Botany an interest which one who merely notices the shape and counts the parts of blossoms, without understanding their plan, has no conception of.

244. That flowers answer to branches may be shown, first, from their position. As explained in the section on Inflorescence, flowers arise from the same places as branches, and from no other; flower-buds, like leaf-buds, appear either on the summit of a stem, that is, as a terminal bud, or in the axil of a leaf, as an axillary bud. And, as the plan of a symmetrical flower shows, the arrangement of the parts on their axis or receptacle is that of leaves upon the stem.

245. That the sepals and petals are of the nature of leaves is evident from their appearance; they are commonly called the leaves of the flower. The calyx is most generally green in color, and foliaceous (leaf-like) in texture. And though the corolla is rarely green, yet neither are proper leaves always green. In our wild Painted-cup, and in some scarlet Sages, common in gardens, the leaves just under the flowers are of the brightest red or scarlet, often much brighter-colored than the corolla itself. And sometimes (as in many Cactuses, and in Carolina Allspice) there is such a regular gradation from the last leaves of the plant (bracts or bractlets) into the leaves of the calyx, that it is impossible to say where the one ends and the other begins. If sepals are leaves, so also are petals; for there is no clearly fixed limit between them. Not only in the Carolina Allspice and Cactus (Fig. 229), but in the Water-Lily (Fig. 228) and in a variety of flowers with more than one row of petals, there is such a complete transition between calyx and corolla that no one can surely tell how many of the leaves belong to the one and how many to the other.

246. That stamens are of the same general nature as petals, and therefore a modification of leaves, is shown by the gradual transitions that occur between the one and the other in many blossoms; especially in cultivated flowers, such as Roses and Camellias, when they begin to *double*, that is, to change their stamens into petals. Some wild and natural flowers show the same interesting transitions. The Carolina Allspice and the White Water-Lily exhibit complete gradations not only between sepals and petals, but between petals and stamens. The sepals of our Water-Lily are green outside, but white and petal-like on the inside; the petals, in many rows, gradually grow narrower towards the centre of the flower; some of these are tipped with a trace of a yellow anther, but still are petals; the next are more contracted and stamen-like, but with a flat petal-like filament; and a further narrowing of this completes the genuine stamen.

228

247. Pistils and stamens now and then change into each other in some Willows; pistils often turn into petals in cultivated flowers; and in the Double Cherry they are occasionally replaced by small green leaves. Sometimes a whole blossom changes into a cluster of green leaves, as in the "green roses" occasionally noticed in gardens, and sometimes it degenerates into a leafy branch. So the botanist regards pistils also as answering to leaves; that is, to single leaves when simple and separate, to a whorl of leaves when conjoined.

229

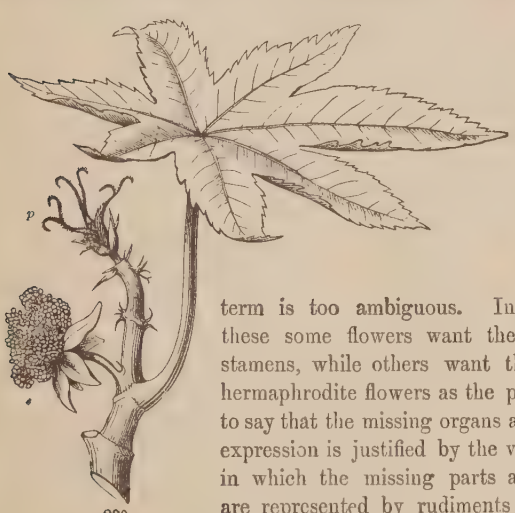
FIG. 228. Series of sepals, petals, and stamens of White Water-Lily, showing the transitions.

FIG. 229. A Cactus blossom.

§ 4. MODIFICATIONS OF THE TYPE.

248. **The Deviations**, as they may be called, from the assumed type or pattern of flower are most various and extensive. The differences between one species and another of the same genus are comparatively insignificant; those between different genera are more striking; those between different families and classes of plants more and more profound. They represent different adaptations to conditions or modes of life, some of which have obvious or probable utilities, although others are beyond particular explanation. The principal modifications may be conveniently classified. First those which in place of perfect (otherwise called *hermaphrodite* or bisexual) flowers, give origin to

249. **Unisexual, or Separated, or Diclinous Flowers**, *imperfect* flowers, as they have been called in contradistinction to perfect flowers; but that



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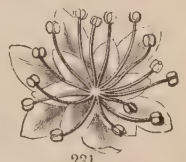

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term is too ambiguous. In these some flowers want the stamens, while others want the pistils. Taking hermaphrodite flowers as the patter.., it is natural to say that the missing organs are *suppressed*. This expression is justified by the very numerous cases in which the missing parts are *abortive*, that is, are represented by rudiments or vestiges, which serve to exemplify the plan, although useless as to office. Unisexual flowers are

Monœcious (or *Monoicous*, i. e. of one household), when flowers of both sorts or sexes are produced by the same individual plant, as in the Ricinus or Castor-oil Plant, Fig. 230.

Diœcious (or *Dioicous*, i. e. of separate households), when the two kinds are borne on different plants; as in Willows, Poplars, Hemp, and Moonseed, Fig. 231, 232.

Polygamous, when the flowers are some of them perfect, and some staminate or pistillate only.

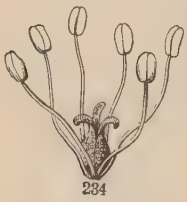
Fig. 230. Unisexual flowers of Castor-oil plant: *s*, staminate flower; *p*, pistillate flower.

Fig. 231, staminate, and 232, pistillate flower of Moonseed.

250. A blossom having stamens and no pistil is a *Staminate* or *Male* flower. Sometimes it is called a *Sterile* flower, not appropriately, for other flowers may equally be sterile. One having pistil but no stamens is a *Pistillate* or *Female* flower.

233

251. **Incomplete Flowers** are so named in contradistinction to complete: they want either one or both of the floral envelopes. Those of Fig. 230 are incomplete, having calyx but no corolla. So is the flower of Anemone (Fig. 233), although its calyx is colored like a corolla. The flowers of Saururus or Lizard's-tail, although perfect, have neither calyx nor corolla (Fig. 234). Incomplete flowers, accordingly, are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Naked or *Achlamydeous*, destitute of both floral envelopes, as in Fig. 234, or *Apetalous*, when wanting only the corolla. The case of corolla present and calyx wholly wanting is extremely rare, although there are seeming instances. In fact, a single or simple perianth is taken to be a calyx, unless the absence or abortion of a calyx can be made evident.

235 227 236 238

252. In contradistinction to regular and symmetrical, very many flowers are

Irregular, that is, with the members of some or all of the floral circles unequal or dissimilar, and

Unsymmetrical, that is, when the circles of the flower or some of them differ in the number of their members. (Symmetrical and unsymmetrical are used in a different sense in some recent books, but the older use should be adhered to.) Want of numerical symmetry and irregularity commonly go together; and both are common. Indeed, few flowers are entirely

FIG. 233. Flower of Anemone Pennsylvanica; apetalous, hermaphrodite.
FIG. 234. Flower of Saururus or Lizard's-tail; naked, but hermaphrodite.
FIG. 235. Flower of Mustard. 236. Its stamens and pistil separate and enlarged.
FIG. 237. Flower of a Violet. 238. Its calyx and corolla displayed: the five smaller parts are the sepals; the five intervening larger ones are the petals.

symmetrical beyond calyx, corolla, and perhaps stamens; and probably no irregular blossoms are quite symmetrical.

253. Irregular and Unsymmetrical Flowers may therefore be illus-

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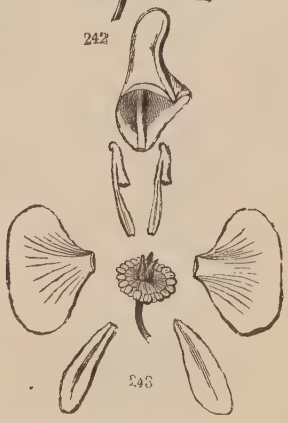

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241

trated together, beginning with cases which are comparatively free from other complications. The blossom of Mustard, and of all the very natural family which it represents (Fig. 235, 236), is regular but unsymmetrical in the stamens. There are four equal sepals, four equal petals; but six stamens, and only two members in the pistil, which for the present may

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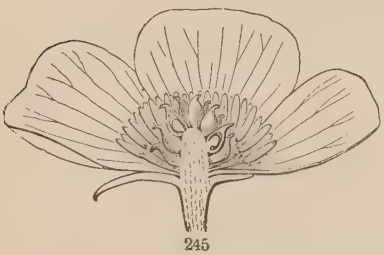
FIG. 239. Flower of a Larkspur. 240. Its calyx and corolla displayed; the five larger parts are the sepals; the four smaller, of two shapes, are the petals; the place of the fifth petal is vacant. 241. Diagram of the same; the place for the missing petal marked by a dotted line.

FIG. 242. Flower of a Monkshood. 243. Its parts displayed; five sepals, the upper forming the hood; the two lateral alike, broad and flat; the two lower small. The two pieces under the hood represent the corolla, reduced to two odd-shaped petals; in centre the numerous stamens and three pistils. 244. Diagram of the calyx and corolla; the three dotted lines in the place of missing petals.

be left out of view. The want of symmetry is in the stamens. These are in two circles, an outer and an inner. The outer circle consists of two stamens only; the inner has its proper number of four. The flower of Violet, which is on the plan of five, is symmetrical in calyx, corolla, and stamens, inasmuch as each of these circles consists of five members; but it is conspicuously irregular in the corolla, one of the petals being very different from the rest.

254. The flowers of Larkspur, and of Monkshood or Aconite, which are nearly related, are both strikingly irregular in calyx and corolla, and considerably unsymmetrical. In Larkspur (Fig. 239–241) the irregular calyx consists of five sepals, one of which, larger than the rest, is prolonged behind into a large sac or spur; but the corolla is of only four petals (of two shapes), — the fifth, needed to complete the symmetry, being left out. And the Monkshood (Fig. 242–244) has five very dissimilar sepals, and a corolla of only two very small and curiously-shaped petals, — the three needed to make up the symmetry being left out. The stamens in both are out of symmetry with the ground-plan, being numerous. So are the pistils, which are usually diminished to three, sometimes to two or to one.

255. **Flowers with Multiplication of Parts** are very common. The stamens are indefinitely numerous in Larkspur and in Monkshood (Fig. 242, 243), while the pistils are fewer than the ground-plan suggests. Most Cactus-flowers have all the organs much increased in number (Fig. 229), and so of the Water-Lily. In Anemone (Fig. 233) the stamens and pistils are multiplied while the petals are left out. In Buttercups or Crowfoot, while the sepals and petals conform to the ground-plan of five, both stamens and pistils are indefinitely multiplied (Fig. 245).



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256. **Flowers modified by Union of Parts**, so that these parts more or less lose the appearance of separate leaves or other organs growing out of the end of the stem or receptacle, are extremely common. There are two kinds of such union, namely: —

Coalescence of parts of the same circle by their contiguous margins; and *Adnation*, or the union of adjacent circles or unlike parts.

257. Coalescence is not rare in leaves, as in the upper pairs of Honeysuckles, Fig. 163. It may all the more be expected in the crowded circles or whorls of flower-leaves. Datura or Stramonium (Fig. 246) shows this coalescence both in calyx and corolla, the five sepals and the five petals being thus united to near their tips, each into a tube or long and narrow cup. These unions make needful the following terms: —

FIG. 245. Flower of Ranunculus bulbosus, or Buttercup, in section.

Gamopetalous, said of a corolla the petals of which are thus coalescent into one body, whether only at base or higher. The union may extend to the very summit, as in Morning Glory and the like (Fig. 247), so that the number of petals in it may not be apparent. The old name for this was *Monopetalous*, but that means "one-petalled;" while gamopetalous means "petals united," and therefore is the proper term.

Polypetalous is the counterpart term, to denote a corolla of *distinct*, that is, separate petals. As it means "many petalled," it is not the best possible name, but it is the old one and in almost universal use.

Gamosepalous applies to the calyx when the sepals are in this way united.

Polysepalous, to the calyx when of separate sepals or calyx-leaves.

258. Degree of union or of separation in descriptive botany is expressed in the same way as is the lobing of leaves (139). See Fig. 249–253, and the explanations.

259. A corolla when gamopetalous commonly shows a distinction (well marked in Fig. 249–251) between a contracted tubular portion below, the TUBE, and the spreading part above, the BORDER or LIMB. The junction between tube and limb, or a more or less enlarged upper portion of the tube between the two, is the THROAT. The same is true of the calyx.

260. Some names are given to particular forms of the gamopetalous corolla, applicable also to a gamosepalous calyx, such as

Wheel-shaped, or *Rotate;* when spreading out at once, without a tube or with a very short one, something in the shape of a wheel or of its diverging spokes, Fig. 252, 253.

246

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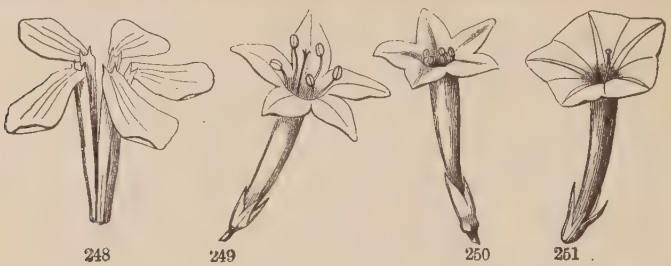
Salver-shaped, or *Salver-form;* when a flat-spreading border is raised on

FIG. 246. Flower of Datura Stramonium; gamosepalous and gamopetalous.

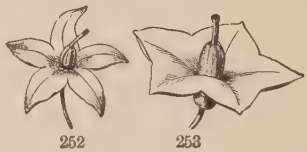
FIG. 247. Funnelform corolla of a common Morning Glory, detached from its polysepalous calyx.

a narrow tube, from which it diverges at right angles, like the salver rep-

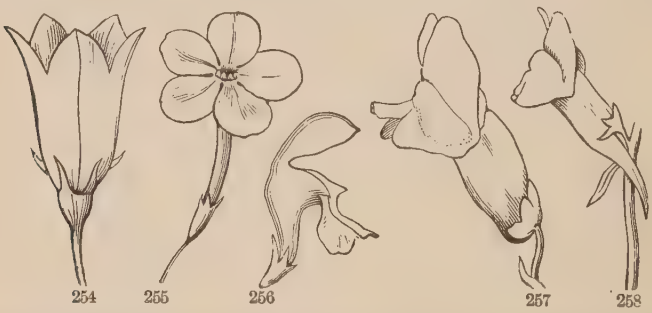


resented in old pictures, with a slender handle beneath, Fig. 249–251, 255.

Bell-shaped, or *Campanulate;* where a short and broad tube widens upward, in the shape of a bell, as in Fig. 254.



Funnel-shaped, or *Funnel-form;* gradually spreading at the summit of a tube which is narrow below, in the



shape of a funnel or tunnel, as in the corolla of the common Morning Glory (Fig. 247) and of the Stramonium (Fig. 246).

Fig. 248. Polypetalous corolla of Soapwort, of five petals with long claws or stalk-like bases.

Fig. 249. Flower of Standing Cypress (Gilia coronopifolia); gamopetalous: the tube answering to the long claws in 248, except that they are coalescent: the limb or border (the spreading part above) is *five-parted*, that is, the petals not there united except at very base.

Fig. 250. Flower of Cypress-vine (Ipomœa Quamoclit); like preceding, but limb *five-lobed.*

Fig. 251. Flower of Ipomœa coccinea; limb almost *entire*.

Fig. 252. Wheel-shaped or rotate and five-parted corolla of Bittersweet, Solanum Dulcamara. 253. Wheel-shaped and five-lobed corolla of Potato.

Fig. 254, Flower of a Campanula or Harebell, with a campanulate or bell-shaped corolla; 255, of a Phlox, with salver-shaped corolla; 256, of Dead-Nettle (Lamium), with labiate *ringent* (or gaping) corolla; 257, of Snapdragon, with labiate *personate* corolla; 258, of Toad-Flax, with a similar corolla spurred at the base.

Tubular; when prolonged into a tube, with little or no spreading at the border, as in the corolla of the Trumpet Honeysuckle, the calyx of Stramonium (Fig. 246), etc.

261. Although sepals and petals are usually all blade or lamina (123), like a sessile leaf, yet they may have a contracted and stalk-like base, answering to petiole. This is called its Claw, in Latin *Unguis*. *Unguiculate* petals are universal and strongly marked in the Pink tribe, as in Soapwort (Fig. 248).

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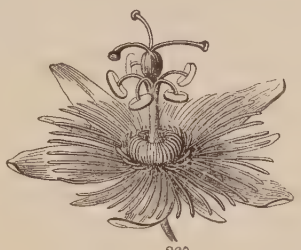

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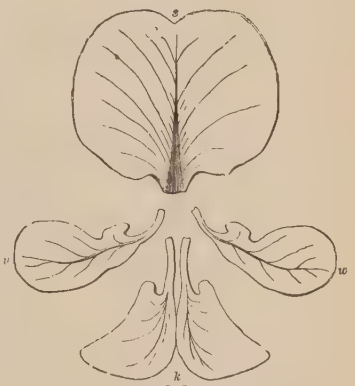
262. Such petals, and various others, may have an outgrowth of the inner face into an appendage or fringe, as in Soapwort, and in Silene (Fig. 259), where it is at the junction of claw and blade. This is called a Crown, or *Corona*. In Passion-flowers (Fig. 260) the crown consists of numerous threads on the base of each petal.

261

263. **Irregular Flowers** may be polypetalous, or nearly so, as in the papilionaceous corolla; but most of them are irregular through coalescence, which often much disguises the numerical symmetry also. As affecting the corolla the following forms have received particular names:



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264. **Papilionaceous Corolla**, Fig. 261, 262. This is polypetalous, except that two of the petals cohere, usually but slightly. It belongs only to the Leguminous or Pulse family. The name means butterfly-like; but the likeness is hardly obvious. The names of the five petals of the *papilionaceous* corolla are curiously incongruous. They are,

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Fig. 259. Unguiculate (clawed) petal of a Silene; with a two-parted crown.

Fig. 260. A small Passion-flower, with crown of slender threads.

Fig. 261. Front view of a papilionaceous corolla. 262. The parts of the same, displayed: *s*, Standard, or Vexillum; *w*, Wings, or Alæ; *k*, Keel, or Carina.

The Standard or *Banner* (*Vexillum*), the large upper petal which is external in the bud and wrapped around the others.

The Wings (*Alæ*), the pair of side petals, of quite different shape from the standard.

The Keel (*Carina*), the two lower and usually smallest petals; these are lightly coalescent into a body which bears some likeness, not to the keel, but to the prow of a boat; and this encloses the stamens and pistil. A Pea-blossom is a typical example; the present illustration is from a species of Locust, Robinia hispida.

265. Labiate Corolla (Fig. 256–258), which would more properly have been called *Bilabiate*, that is, two-lipped. This is a common form of gamopetalous corolla; and the calyx is often bilabiate also. These flowers are all on the plan of five; and the irregularity in the corolla is owing to unequal union of the petals as well as to diversity of form. The two petals of the upper or posterior side of the flower unite with each other higher up than with the lateral petals (in Fig. 256, quite to the top), forming the *Upper lip:* the lateral and the lower similarly unite to form the *Lower lip*. The single notch which is generally found at the summit of the upper lip, and the two notches of the lower lip, or in other words the two lobes of the upper and the three of the lower lip, reveal the real composition. So also does the alternation of these five parts with those of the calyx outside. When the calyx is also bilabiate, as in the Sage, this alternation gives three lobes or sepals to the upper and two to the lower lip. Two forms of the labiate corolla have been designated, viz.: —

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Ringent or *Gaping*, when the orifice is wide open, as in Fig. 256.

Personate or *Masked*, when a protuberance or intrusion of the base of the lower lip (called a *Palate*) projects over or closes the orifice, as in Snapdragon and Toad-Flax, Fig. 257, 258.

Fig. 263. Corolla of a purple Gerardia laid open, showing the four stamens; the cross shows where the fifth stamen would be, if present.

Fig. 264. Corolla, laid open, and stamens of Pentstemon grandiflorus, with a sterile filament in the place of the fifth stamen, and representing it.

Fig. 265. Corolla of Catalpa laid open, displaying two good stamens and three abortive ones or vestiges.

266. There are all gradations between labiate and regular corollas. In those of Gerardia, of some species of Pentstemon, and of Catalpa (Fig 263–265), the labiate character is slight, but is manifest on close inspection. In almost all such flowers the plan of five, which is obvious or ascertainable in the calyx and corolla, is obscured in the stamens by the abortion or suppression of one or three of their number.

267. **Ligulate Corolla.** The ligulate or *Strap-shaped* corolla mainly belongs to the family of Compositæ, in which numerous small flowers are

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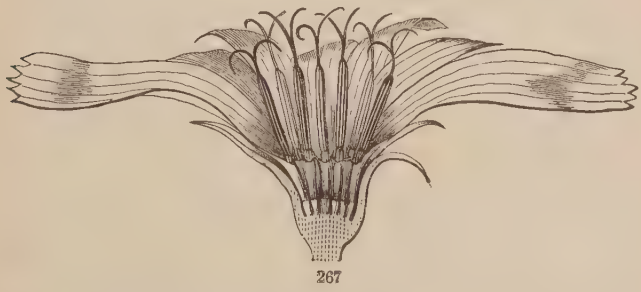
gathered into a head, within an involucre that imitates a calyx. It is best exemplified in the Dandelion and in Chiccory (Fig. 266). Each one of these straps or *Ligules,* looking like so many petals, is the corolla of a dis-



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tinct flower: the base is a short tube, which opens out into the ligule: the five minute teeth at the end indicate the number of constituent petals. So this is a kind of gamopetalous corolla, which is open along one side nearly

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Fig. 266. Two flower-heads of Chiccory.

Fig. 267. One of them half cut away, better showing some of the flowers.

to the base, and outspread. The nature of such a corolla (and of the stamens also, to be explained in the next section) is illustrated by the flower of a Lobelia, Fig. 285.

268. In Asters, Daisies, Sunflower, Coreopsis (Fig. 268), and the like, only the marginal (or *Ray*) corollas are ligulate; the rest (those of the *Disk*) are regularly gamopetalous, tubular, and five-lobed at summit; but they are small and individually inconspicuous, only the *ray-flowers* making a show. In fact, those of Coreopsis and of Sunflower are simply for show, these ray-flowers being not only sterile, but *neutral*, that is, having neither stamens nor pistil. But in Asters, Daisies, Golden-rods, and the like, these ray-flowers are pistillate and fertile, serving

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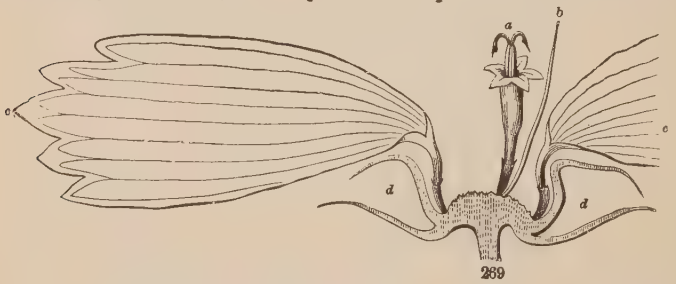

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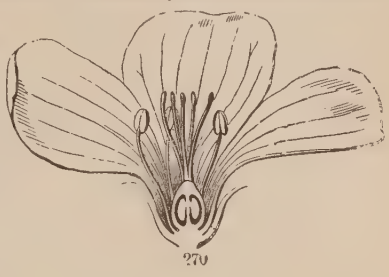
therefore for seed-bearing as well as for show. Let it not be supposed that the show is useless. See Section XIII.

269. **Adnation, or Consolidation,** is the union of the members of parts belonging to different circles of the flower (256). It is of course understood that in this (as likewise in coalescence) the parts are not formed and then conjoined, but are produced in union. They are born united, as the term *adnate* implies. To illustrate this kind of union, take the accompanying series of flowers (Fig. 270–274), shown in vertical section. In the first, Fig. 270, Flax-flower, there is no adnation; sepals, petals, and stamens, are *free* as well as distinct, being separately borne on the receptacle, one circle within or above the next; only the five pistils have their ovaries coalescent. In Fig. 271, a Cherry flower, the petals and stamens are borne on the throat of the calyx-tube; that is, the sepals are coalescent into a cup, and the petals and stamens are adnate to the inner face of this; in other

FIG. 268. Head of flowers of a Coreopsis, divided lengthwise.

FIG. 269. A slice of the preceding more enlarged, with one tubular perfect flower (*a*) left standing on the receptacle, with its bractlet or chaff (*b*), one ligulate and neutral ray-flower (*cc*), and part of another; *dd*, section of bracts or leaves of the involucre.

words, the sepals, petals, and stamens are all consolidated up to a certain height. In Fig. 272, a Purslane-flower, the same parts are adnate to or consolidated with the ovary up to its middle. In Fig. 273, a Hawthorn-flower, the consolidation has extended over the whole ovary; and petals and stamens are adnate to the calyx still further. In Fig. 274, a Cranberry-blossom, it is the same except that all the parts are free at the same height; all seem to arise from the top of the ovary.



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270. In botanical description, to express tersely such differences in the relation of these organs to the pistil, they are said to be

Hypogynous (i. e. under the pistil) when they are all *free*, that is, not adnate to pistil nor connate with each other, as in Fig. 270.

Perigynous (around the pistil) when connate with each other, that is, when petals and stamens are *inserted* or borne on the calyx, whether as in Cherry-flowers (Fig. 271) they are free from the pistil, or as in Purslane and Hawthorn (Fig. 272, 273) they are also adnate below to the ovary.

Epigynous (on the ovary) when so adnate that all these parts appear to arise from the very summit of the ovary, as in Fig. 274. The last two terms are not very definitely distinguished.

271. Another and a simpler form of expression is to describe parts of the flower as being

Free, when not united with or *inserted* upon other parts.

Distinct, when parts of the same kind are not united. This term is the counterpart of coalescent, as free is the counterpart of adnate. Many writers use the term "free" indiscriminately for both; but it is better to distinguish them.

Fig. 270 Flax-flower in section; the parts all free, — hypogynous.

Fig. 271. Cherry-flower in section; petals and stamens adnate to tube of calyx, — perigynous.

Fig. 272. Purslane-flower in section; calyx, petals, stamens, all adnate to lower half of ovary, — perigynous.

Connate is a term common for either not free or not distinct, that is, for parts united congenitally, whether of same or of different kinds.

Adnate, as properly used, relates to the union of dissimilar parts.

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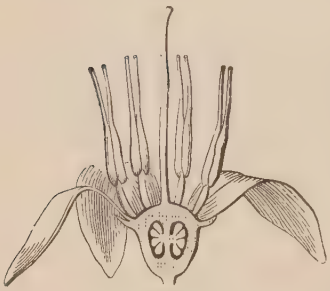

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272. In still another form of expression, the terms superior and inferior have been much used in the sense of above and below.

Superior is said of the ovary of Flax-flower, Cherry, etc., because above the other parts; it is equivalent to "ovary free." Or it is said of the calyx, etc., when above the ovary, as in Fig. 273–275.

Inferior, when applied to the ovary, means the same as "calyx adnate;" when applied to the floral envelopes, it means that they are free.

273. **Position of Flower or of its Parts.** The terms superior and inferior, or upper and lower, are also used to indicate the relative position of the parts of a flower in reference to the axis of inflorescence. An axillary flower stands between the bract or leaf which subtends it and the axis or stem which bears this bract or leaf. This is represented in sectional diagrams (as in Fig. 275, 276) by a transverse line for the bract, and a small circle for the axis of inflorescence. Now the side of the blossom which faces the bract is the

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Anterior, or *Inferior*, or *Lower* side; while the side next the axis is the *Posterior*, or *Superior*, or *Upper* side of the flower.

274. So, in the labiate corolla (Fig. 256–258), the lip which is composed of three of the five petals is the *anterior*, or *inferior*, or *lower* lip; the other is the *posterior*, or *superior*, or *upper* lip.

Fig. 273. Hawthorn-blossom in section; parts adnate to whole face of ovary, and with each other beyond; another grade of perigynous.

Fig. 274. Cranberry-blossom in section; parts epigynous.

Fig. 275. Diagram of papilionaceous flower (Robinia, Fig. 261), with bract below; axis of inflorescence above.

Fig. 276. Diagram of Violet-flower; showing the relation of parts to bract and axis.

275. In Violets (Fig. 238, 276), the odd sepal is posterior (next the axis); the odd petal is therefore anterior, or next the subtending leaf. In the papilionaceous flower (Fig. 261, and diagram, Fig. 275), the odd sepal is anterior, and so two sepals are posterior; consequently, by the alternation, the odd petal (the standard) is posterior or upper, and the two petals forming the keel are anterior or lower.

§ 5. ARRANGEMENT OF PARTS IN THE BUD.

276. **Æstivation** was the fanciful name given by Linnæus to denote the disposition of the parts, especially the leaves of the flower, before *Anthesis*, i. e. before the blossom opens. *Præfloration*, a better term, is sometimes used. This is of importance in distinguishing different families or genera of plants, being generally uniform in each. The æstivation is best seen by making a slice across the flower-bud; and it may be expressed in diagrams, as in the accompanying figures.

277. The pieces of the calyx or the corolla either overlap each other in the bud, or they do not. When they do not overlap, the æstivation is

Valvate, when the pieces meet each other by their abrupt edges, without any infolding or overlapping; as the calyx of the Linden or Basswood (Fig. 277).

277

Induplicate, which is valvate with the margins of each piece projecting inwards, as in the calyx of a common Virgin's-bower, Fig. 278, or

Involute, which is the same but the margins rolled inward, as in most of the large-flowered species of Clematis, Fig. 279.

Reduplicate, a rarer modification of valvate, is similar but with margins projecting outward.

278 279

Open, the parts not touching in the bud, as the calyx of Mignonette.

278. When the pieces overlap in the bud, it is in one of two ways; either every piece has one edge in and one edge out, or some pieces are wholly outside and others wholly inside. In the first case the æstivation is

Convolute, also named *Contorted* or *Twisted*, as in Fig. 280, a cross-section of a corolla very strongly thus convolute or rolled up together, and in the corolla of a Flax-flower (Fig. 281), where the petals only moderately overlap in this way. Here one edge of every petal covers the next before

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Fig. 277. Diagram of a flower of Linden, showing the calyx valvate and corolla imbricate in the bud, etc.

Fig. 278. Valvate-induplicate æstivation of calyx of common Virgin's-bower. Fig. 279. Valvate-involute æstivation of same in Vine-bower, Clematis Vitialba.

it, while its other edge is covered by the next behind it. The other mode is the

Imbricate or *Imbricated*, in which the outer parts cover or overlap the inner so as to "break joints," like tiles or shingles on a roof; whence the name. When the parts are three, the first or outermost is wholly external, the third wholly internal, the second has one margin covered by the first while the other overlaps the third or innermost piece: this is the arrangement of alternate three-ranked leaves (187). When there are five pieces, as in the corolla of Fig. 325, and calyx of Fig. 281, as also of Fig. 241, 276, two are external, two are internal, and one (the third in the spiral) has one edge covered by the outermost, while its other edge covers the innermost; which is just the five-ranked arrangement of alternate leaves (188). When the pieces are four, two are outer and two are inner; which answers to the arrangement of opposite leaves.

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279. The imbricate and the convolute modes sometimes vary one into the other, especially in the corolla.

280. In a gamopetalous corolla or gamosepalous calyx, the shape of the tube in the bud may sometimes be noticeable. It may be

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Plicate or *Plaited*, that is, folded lengthwise; and the plaits may either be turned outwards, forming projecting ridges, as in the corolla of Campanula; or turned inwards, as in that of Gentian Belladonna; or

Supervolute, when the plaits are convolutely wrapped round each other, as in the corolla of Morning Glory and of Stramonium, Fig. 282.

Section IX. STAMENS IN PARTICULAR.

281. **Androecium** is a technical name for the staminate system of a flower (that is, for the stamens taken together), which it is sometimes convenient to use. The preceding section has dealt with modifications of the flower pertaining mainly to calyx and corolla. Those relating to the stamens are now to be indicated. First as to

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Fig. 280. Convolute æstivation, as in the corolla-lobes of Oleander.

Fig. 281. Diagram of a Flax-flower; calyx imbricated and corolla convolute in the bud.

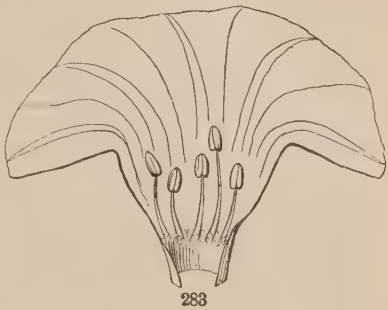
Fig. 282. Upper part of corolla of Datura Stramonium in the bud; and below a section showing the convolution of the plaits.

282. **Insertion, or place of attachment.** The stamens usually go with the petals. Not rarely they are at base

Epipetalous, that is, inserted on (or adnate to) the corolla, as in Fig. 283. When free from the corolla, they may be

Hypogynous, inserted on the receptacle under the pistil or gynœcium.

Perigynous, inserted on the calyx, that is, with the lower part of filament adnate to the calyx-tube.



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Epigynous, borne apparently on the top of the ovary; all which is explained in Fig. 270–274.

Gynandrous is another term relating to insertion of rarer occurrence, that is, where the stamens are inserted on (in other words, adnate to) the style, as in Lady's Slipper (Fig. 284), and in the Orchis family generally.

284

283. **In Relation to each Other,** stamens are more commonly

Distinct, that is, without any union with each other. But when united, the following technical terms of long use indicate their modes of mutual connection:—

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Monadelphous (from two Greek words, meaning "in one brotherhood"), when united by their filaments into one set, usually into a ring or cup below, or into a tube, as in the Mallow Family (Fig. 286), the Passion-flower (Fig. 260), the Lupine (Fig. 287), and in Lobelia (Fig. 285).

Diadelphous (meaning in two brotherhoods), when united by the filaments into two sets, as in the Pea and most of its near relatives (Fig. 288), usually nine in one set, and one in the other.

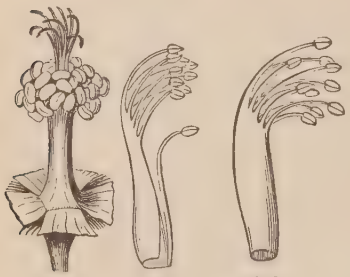
Triadelphous (three brotherhoods), when the filaments are united in three sets or clusters, as in most species of Hypericum.

Fig. 283. Corolla of Morning Glory laid open, to show the five stamens inserted on it, near the base.

Fig. 284. Style of a Lady's Slipper (Cypripedium), and stamens united with it; *a*, *a*, the anthers of the two good stamens; *st*, an abortive stamen, what should be its anther changed into a petal-like body; *stig*, the stigma.

Fig. 285. Flower of Lobelia cardinalis, Cardinal flower; corolla making approach to the ligulate form; filaments (*st*) monadelphous, and anthers (*a*) syngenesious.

Pentadelphous (five brotherhoods), when in five sets, as in some species of Hypericum and in American Linden (Fig. 277, 289).



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Polyadelphous (many or several brotherhoods) is the term generally employed when these sets are several, or even more than two, and the particular number is left unspecified. These terms all relate to the filaments.

Syngenesious is the term to denote that stamens have their anthers united, coalescent into a ring or tube; as in Lobelia (Fig. 285), in Violets, and in all of the great family of Compositæ.

284. Their Number in a flower is commonly expressed directly, but sometimes adjectively, by a series of terms which were the name of classes in the Linnæan artificial system, of which the following names, as also the preceding, are a survival: —

Monandrous, i. e. solitary-stamened, when the flower has only one stamen,

Diandrous, when it has two stamens only,

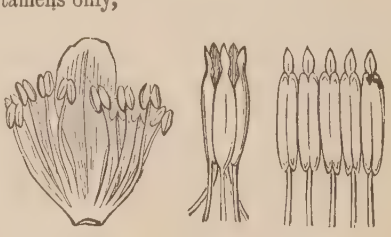
Triandrous, when it has three stamens,

Tetrandrous, when it has four stamens,

Pentandrous, when it has five stamens,

Hexandrous, when with six stamens, and so on to

Polyandrous, when it has many stamens, or more than a dozen.



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285. For which terms, see the Glossary. They are all Greek numerals prefixed to *-andria* (from the Greek), which Linnæus used for *andrœcium*, and are made into an English adjective, *-androus*. Two other terms, of same origin, designate particular cases of number (four or six) in connection with unequal length. Namely, the stamens are

Didynamous, when, being only four, they form two pairs, one pair longer than the other, as in the Trumpet Creeper, in Gerardia (Fig. 263), etc.

Fig. 286. Flower of a Mallow, with calyx and corolla cut away; showing monadelphous stamens.

Fig. 287. Monadelphous stamens of Lupine. 288. Diadelphous stamens (9 and 1) of a Pea-blossom.

Fig. 289. One of the five stamen-clusters of the flower of American Linden, with accompanying scale. The five clusters are shown in section in the diagram of this flower, Fig. 277.

Fig. 290. Five syngenesious stamens of a Coreopsis. 291. Same, with tube laid open and displayed.

Tetradynamous, when, being only six, four of them surpass the other two, as in the Mustard-flower and all the Cruciferous family, Fig. 235.

286. **The Filament** is a kind of stalk to the anther, commonly slender or thread-like: it is to the anther nearly what the petiole is to the blade of a leaf. Therefore it is not an essential part. As a leaf may be without a stalk, so the anther may be *Sessile*, or without a filament.

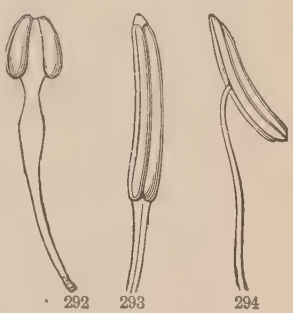
287. **The Anther** is the essential part of the stamen. It is a sort of case, filled with a fine powder, *the Pollen*, which serves to fertilize the pistil, so that it may perfect seeds. The anther is said to be

Innate (as in Fig. 292), when it is attached by its base to the very apex of the filament, turning neither inward nor outward;

Adnate (as in Fig. 293), when attached as it were by one face, usually for its whole length, to the side of a continuation of the filament; and

Versatile (as in Fig. 294), when fixed by or near its middle only to the very point of the filament, so as to swing loosely, as in the Lily, in Grasses, etc. Versatile or adnate anthers are

Introrse, or *Incumbent*, when facing inward, that is, toward the centre of the flower, as in Magnolia, Water-Lily, etc.



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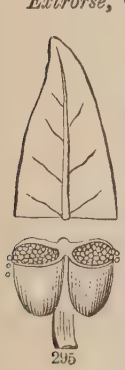
Extrorse, when facing outwardly, as in the Tulip-tree.



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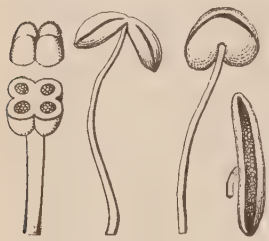
288. Rarely does a stamen bear any resemblance to a leaf, or even to a petal or flower-leaf. Nevertheless, the botanist's idea of a stamen is that it answers to a leaf developed in a peculiar form and for a special purpose. In the filament he sees the stalk of the leaf; in the anther, the blade. The blade of a leaf consists of two similar sides; so the anther consists of two Lobes or Cells, one answering to the left, the other to the right, side of the blade. The two lobes are often connected by a prolongation of the filament, which answers to the midrib of a leaf; this is called the Connective. This is conspicuous in Fig. 292, where the connective is so broad that it separates the two cells of the anther to some distance.

289. A simple conception of the morphological relation of an anther to a leaf is given in Fig. 295, an ideal figure, the lower part representing a stamen with the top of its anther cut away; the upper, the corresponding upper part of a leaf.

Fig. 292. Stamen of Isopyrum, with innate anther. 293. Of Tulip-tree, with adnate (and extrorse) anther. 294. Of Evening Primrose, with versatile anther.

Fig. 295. Diagram of the lower part of an anther, cut across above, and the upper part of a leaf, to show how the one answers to the other; the filament to petiole, the connective to midrib; the two cells to the right and left halves of the blade.

290. So anthers are generally *two-celled*. But as the pollen begins to form in two parts of each cell (the anterior and the posterior), sometimes these two strata are not confluent, and the anther even at maturity may be *four-celled*, as in Moonseed (Fig. 296); or rather, in that case (the word *cell* being used for each lateral half of the organ), it is *two-celled*, but the cells *bilocellate*.



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291. But anthers may become *one-celled*, and that either by confluence or by suppression.

292. By confluence, when the two cells run together into one, as they nearly do in most species of Pentstemon (Fig. 297), more so in Monarda (Fig. 300), and completely in the Mallow (Fig. 298) and all the Mallow family.

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FIG. 296. Stamen of Moonseed, with anther cut across; this 4-celled, or rather 4-locellate.

FIG. 297. Stamen of Pentstemon pubescens; the two anther-cells diverging, and almost confluent.

FIG. 298. Stamen of Mallow; the anther supposed to answer to that of Fig. 297, but the cells completely confluent into one.

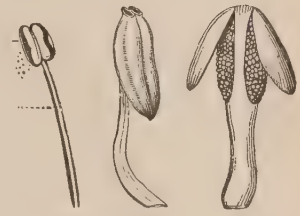
FIG. 299. Stamen of Globe Amaranth; very short filament bearing a single anther-cell; it is open from top to bottom, showing the pollen within.

FIG. 300–305. Stamens of several plants of the Labiate or Mint Family. FIG. 300. Of a Monarda: the two anther-cells with bases divergent so that they are transverse to the filament, and their contiguous tips confluent, so as to form one cell opening by a continuous line. FIG. 301. Of a Calamintha: the broad connective separating the two cells. FIG. 302. Of a Sage (Salvia Texana; with long and slender connective resembling forks of the filament, one bearing a good anther-cell; the other an abortive or poor one. FIG. 303. Another Sage (S. coccinea), with connective longer and more thread-shaped, the lower fork having its anther-cell wholly wanting. FIG. 304. Of a White Sage, Audibertia grandiflora; the lower fork of connective a mere vestige. FIG. 305. Of another White Sage (A. stachyoides), the lower fork of connective suppressed.

293. By suppression in certain cases the anther may be reduced to one cell or halved. In Globe Amaranth (Fig. 299) there is a single cell without vestige of any other. Different species of Sage and of the White Sages of California show various grades of abortion of one of the anther-cells, along with a singular lengthening of the connective (Fig. 302–305).

294. The splitting open of an anther for the discharge of its pollen is termed its *Dehiscence*.

295. As the figures show, this is commonly by a line along the whole length of each cell, either lateral or, when the anthers are extrorse, often along the outer face, and when introrse, along the inner face of each cell. Sometimes the opening is only by a chink, hole, or pore at the top, as in the Azalea, Pyrola (Fig. 307), etc.; sometimes a part of the face separates as a sort of trap-door (or valve), hinged at the top, and opening to allow the escape of the pollen, as in the Sassafras, Spice-bush, and Barberry (Fig. 308).



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296. Pollen. This is the powdery matter, commonly of a yellow color, which fills the cells of the anther, and is discharged during blossoming,

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after which the stamens generally fall or wither away. Under the microscope it is found to consist of grains, usually round or oval, and all alike in the same species, but very different in different plants. So that the

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plant may sometimes be recognized from the pollen alone. Several forms are shown in the accompanying figures.

Fig. 306. Stamen with the usual dehiscence of anther down the side of each cell.

Fig. 307. Stamen of Pyrola; cells opening by a terminal hole.

Fig. 308. Stamen of Barberry; cells of anther each opening by an uplifted valve.

Fig. 309. Magnified pollen of a Lily, smooth and oval; 310, of Echinocystis, grooved lengthwise; 311, of Sicyos, with bristly points and smooth bands; 312, of Musk Plant (Mimulus), with spiral grooves; 313, of Succory, twelve-sided and dotted.

Fig. 314. Magnified pollen of Hibiscus and other Mallow-plants, beset with prickly projections; 315, of Circæa, with angles bearing little lobes; 316, of Even

297. An ordinary pollen-grain has two coats; the outer coat thickish, but weak, and frequently adorned with lines or bands, or studded with points; the inner coat is extremely thin and delicate, but extensible, and its cavity when fresh contains a thickish protoplasmic fluid, often rendered turbid by an immense number of minute particles that float in it. As the pollen matures this fluid usually dries up, but the protoplasm does not lose its vitality. When the grain is wetted it absorbs water, swells up, and is apt to burst, discharging the contents. But when weak syrup is used it absorbs this slowly, and the tough inner coat will sometimes break through the outer and begin a kind of growth, like that which takes place when the pollen is placed upon the stigma.

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298. Some pollen-grains are, as it were, lobed (as in Fig. 315, 316), or formed of four grains united (as in the Heath family, Fig. 317): that of Pine (Fig. 318) has a large rounded and empty bladder-like expansion upon each side. This renders such pollen very buoyant, and capable of being transported to a great distance by the wind.

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299. In species of Acacia simple grains lightly cohere into globular pellets. In Milkweeds and in most Orchids all the pollen of an anther-cell is compacted or coherent into one mass, called a *Pollen-mass*, or Pollinium, plural Pollinia. (Fig. 319–322.)

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ing Primrose, the three lobes as large as the central body; 317, of Kalmia, four grains united, as in most of the Heath family; 318, of Pine, as it were of three grains or cells united; the lateral empty and light.

Fig. 319. Pollen, a pair of pollinia of a Milkweed, Asclepias, attached by stalks to a gland; moderately magnified.

Fig. 320. Pollinium of an Orchis (Habenaria), with its stalk attached to a sticky gland; magnified. 321. Some of the packets or partial pollinia, of which Fig. 320 is made up, more magnified.

Fig. 322. One of the partial pollinia, torn up at top to show the grains (which are each composed of four), and highly magnified.

SECTION X. PISTILS IN PARTICULAR.

§ 1. ANGIOSPERMOUS OR ORDINARY GYNŒCIUM.

300. **Gynœcium** is the technical name for the pistil or pistils of a flower taken collectively, or for whatever stands in place of these. The various modifications of the gynœcium and the terms which relate to them require particular attention.

301. THE PISTIL, when only one, occupies the centre of the flower; when there are two pistils, they stand facing each other in the centre of the flower; when several, they commonly form a ring or circle; and when very numerous, they are generally crowded in rows or spirals on the surface of a more or less enlarged or elongated receptacle. Their number gives rise to certain terms, the counterpart of those used for stamens (284), which are survivals of the names of orders in the Linnæan artificial system. The names were coined by prefixing Greek numerals to *-gynia* used for gynœcium, and changed into adjectives in the form of *-gynous*. That is, a flower is

Monogynous, when it has a single pistil, whether that be simple or compound;

Digynous, when it has only two pistils; *Trigynous*, when with three, *Tetragynous*, with four; *Pentagynous*, with five; *Hexagynous*, with six; and so on to *Polygynous*, with many pistils.

302. **The Parts of a Complete Pistil**, as already twice explained (16, 236), are the OVARY, the STYLE, and the STIGMA. The ovary is one essential part: it contains the rudiments of seeds, called OVULES. The stigma at the summit is also essential: it receives the pollen, which fertilizes the ovules in order that they may become seeds. But the style, commonly a tapering or slender column borne on the summit of the ovary, and bearing the stigma on its apex or its side, is no more necessary to a pistil than the filament is to the stamen. Accordingly, there is no style in many pistils: in these the stigma is *sessile*, that is, rests directly on the ovary (as in Fig. 326). The stigma is very various in shape and appearance, being sometimes a little knob (as in the Cherry, Fig. 271), sometimes a point or small surface of bare tissue (as in Fig. 327-330), and sometimes a longitudinal crest or line (as in Fig. 324, 341-343), or it may occupy the whole length of the style, as in Fig. 331.

303. The word Pistil (Latin, *Pistillum*) means a pestle. It came into use in the first place for such flowers as those of Crown Imperial, or Lily, in which the pistil in the centre was likened to the pestle, and the perianth around it to the mortar, of the apothecary.

304. A pistil is either *simple* or *compound*. It is simple when it answers to a single flower-leaf, compound when it answers to two or three, or a fuller circle of such leaves conjoined.

305. **Carpels.** It is convenient to have a name for each flower-leaf of the gynœcium; so it is called a *Carpel*, in Latin *Carpellum* or *Carpidium*. A simple pistil is a carpel. Each component flower-leaf of a compound pistil is likewise a carpel. When a flower has two or more pistils, these of course are simple pistils, that is, separate carpels or pistil-leaves. There may be only a single simple pistil to the flower, as in a Pea or Cherry blossom (Fig. 271); there may be two such, as in many Saxifrages; or many, as in the Strawberry. More commonly the single pistil in the centre of a blossom is a compound one. Then there is seldom much difficulty in ascertaining the number of carpels or pistil-leaves that compose it.

306. **The Simple Pistil,** viewed morphologically, answers to a leaf-blade with margins incurved and united where they meet, so forming a closed case or pod (the ovary), and bearing ovules at the suture or junction of these margins: a tapering upper portion with margins similarly inrolled, is supposed to form the style; and these same margins, exposed at the tip or for a portion of the length, become the stigma. Compare, under this view, the three accompanying figures.

307. So a simple pistil should have a one-celled ovary, only one line of attachment for the ovules, a single style, and a single stigma. Certain variations from this normal condition which sometimes occur do not invalidate this morphological conception. For instance, the stigma may become two-lobed or two-ridged, because it consists of two leaf-margins, as Fig. 324 shows; it may become 2-locellate by the turning or growing inward of one of the sutures, so as to divide the cavity.

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308. There are two or three terms which primarily relate to the parts of a simple pistil or carpel, and are thence carried on to the compound pistil, viz.:—

Ventral Suture, the line which answers to the united margins of the carpel-leaf, therefore naturally called a suture or seam, and the ventral or inner one, because in the circle of carpel-leaves it looks inward or to the centre of the flower.

Dorsal Suture is the line down the back of the carpel, answering to

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Fig. 323. An inrolled small leaf, such as in double-flowered Cherry blossoms is often seen to occupy the place of a pistil.

Fig. 324. A simple pistil (of Isopyrum), with ovary cut across; the inner (ventral) face turned toward the eye: the ovules seem to be borne on the ventral suture, answering to leaf-margins: the stigma above seen also to answer to leaf-margins.

Fig. 325. Pod or simple pistil of Caltha or Marsh-Marigold, which has opened and shed its seeds.

the midrib of the leaf, — not a seam therefore; but at maturity many fruits, such as pea-pods, open by this dorsal as well as by the ventral line.

Placenta, a name given to the surface, whatever it be, which bears the ovules and seeds. The name may be needless when the ovules grow directly on the ventral suture, or from its top or bottom; but when there are many ovules there is usually some expansion of an ovule-bearing or seed-bearing surface; as is seen in our Mandrake or Podophyllum, Fig. 326.

309. **A Compound Pistil** is a combination of two, three, or a greater number of pistil-leaves or carpels in a circle, united into one body, at least

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by their ovaries. The annexed figures should make it clear. A series of Saxifrages might be selected the gynœcium of which would show every gradation between two simple pistils, or separate carpels, and their complete coalescence into one compound and two-celled ovary. Even when the constituent styles and stigmas are completely coalescent into one, the nature of the combination is usually revealed by some external lines or grooves, or (as in Fig. 328–330) by the internal partitions, or the number of the placentæ. The simplest case of compound pistil is that

310. **With two or more Cells and Axile Placentæ**, namely, with as many cells as there are carpels, that have united to compose the organ.

Fig. 326. Simple pistil of Podophyllum, cut across, showing ovules borne on placenta.

Fig. 327. Pistil of a Saxifrage, of two simple carpels or pistil-leaves, united at the base only, cut across both above and below.

Fig. 328. Compound 3-carpellary pistil of common St. John's-wort, cut across: the three styles separate.

Fig. 329. The same of shrubby St. John's-wort; the three styles as well as ovaries here united into one.

Fig. 330. Compound 3-carpellary pistil of Tradescantia or Spiderwort; the three stigmas as well as styles and ovary completely coalescent into one.

Such a pistil is just what would be formed if the simple pistils (two, three, or five in a circle, as the case may be), like those of a Pæony or Stonecrop (Fig. 224, 225), pressed together in the centre of the flower, were to cohere by their contiguous parts. In such a case the placentæ are naturally *axile*, or all brought together in the axis or centre; and the ovary has as many DISSEPIMENTS, or internal *Partitions*, as there are carpels in its composition. For these are the contiguous and coalescent walls or sides of the component carpels. When such pistils ripen into pods, they often separate along these lines into their elementary carpels.

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311. **One-celled, with free Central Placenta.** The commoner case is that of Purslane (Fig. 272) and of the Pink and Chickweed families (Fig. 331, 332). This is explained by supposing that the partitions (such as those of Fig. 329) have early vanished or have been suppressed. Indeed, traces of them may often be detected in Pinks. On the other hand, it is equally supposable that in the Primula family the free central is derived from parietal placentation by the carpels bearing ovules only at base, and forming a consolidated common placenta in the axis. Mitella and Dionæa help out this conception.

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312. **One-celled, with Parietal Placentæ.** In this not uncommon case it is conceived that the two or three or more carpel-leaves of such a compound pistil coalesce by their adjacent edges, just as sepal-leaves do to form a gamosepalous calyx, or petals to form a gamopetalous corolla, and as is shown in the diagram, Fig. 333, and in an actual cross-section, Fig. 334. Here each carpel is an open leaf, or with some introflexion, bearing ovules along its margins; and each placenta consists of the con-

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FIG. 331, 332. Pistil of a Sandwort, with vertical and transverse section of the ovary: free central placenta.

FIG. 333. Plan of a one-celled ovary of three carpel-leaves, with parietal placentæ, cut across below, where it is complete; the upper part showing the top of the three leaves it is composed of, approaching, but not united.

FIG. 334. Cross section of the ovary of Frost-weed (Helianthemum), with three parietal placentæ, bearing ovules.

FIG. 335. Cross section of an ovary of Hypericum graveolens, the three large placentæ meeting in the centre, so as to form a three-celled ovary. 336. Same in fruit, the placentæ now separate and rounded.

tiguous margins of two pistil-leaves grown together. There is every gradation between this and the three-celled ovary with the placentæ in the axis, even in the same genus, sometimes even in different stages in the same pistil (Fig. 335, 336).

§ 2. GYMNOSPERMOUS GYNŒCIUM.

313. The ordinary pistil has a closed ovary, and accordingly the pollen can act upon the contained ovules only indirectly, through the stigma. This is expressed in a term of Greek derivation, viz.: —

Angiospermous, meaning that the seeds are borne in a sac or closed vessel. The counterpart term is

Gymnospermous, meaning naked-seeded. This kind of pistil, or gynœcium, the simplest of all, yet the most peculiar, characterizes the Pine family and its relatives.

314. While the ordinary simple pistil is conceived by the botanist to be a leaf rolled together into a closed pod (306), those of the Pine, Larch (Fig. 337), Cedar, and Arbor-Vitæ (Fig. 338, 339) are open leaves, in the form of scales, each bearing two or more ovules on the inner face, next the base. At the time of blossoming, these pistil-leaves of the young cone diverge, and the pollen, so abundantly shed from the staminate blossoms, falls directly upon the exposed ovules. Afterward the scales close over each other until the seeds are ripe. Then they separate that the seeds may be shed. As the pollen acts directly on the ovules, such pistil (or organ acting as pistil) has no stigma.

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315. In the Yew, and in Torreya and Gingko, the gynœcium is reduced to extremest simplicity, that is, to a naked ovule, without any visible carpel.

316. In Cycas the large naked ovules are borne on the margins or lobes of an obvious open leaf. All GYMNOSPERMOUS plants have other peculiarities, also distinguishing them, as a class, from ANGIOSPERMOUS plants.

FIG. 337. A pistil, that is, a scale of the cone, of a Larch, at the time of flowering; inside view, showing its pair of naked ovules.

FIG. 338. Branchlet of the American Arbor-Vitæ, considerably larger than in nature, terminated by its pistillate flowers, each consisting of a single scale (an open pistil), together forming a small cone.

FIG. 339. One of the scales or carpels of the last, removed and more enlarged, the inside exposed to view, showing a pair of ovules on its base.

Section XI. OVULES.

317. Ovule (from the Latin, meaning a little egg) is the technical name of that which in the flower answers to and becomes the seed.

318. Ovules are *naked* in gymnospermous plants (as just described); in all others they are enclosed in the ovary. They may be produced along the whole length of the cell or cells of the ovary, and then they are apt to be numerous; or only from some part of it, generally the top or the bottom. In this case they are usually few or single (*solitary*, as in Fig. 341–343). They may be *sessile*, i. e. without stalk, or they may be attached by a distinct stalk, the Funicle or Funiculus (Fig. 340).

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319. Considered as to their position and direction in the ovary, they are

Horizontal, when they are neither turned upward nor downward, as in Podophyllum (Fig. 326);

Ascending, when rising obliquely upwards, usually from the side of the cell, not from its very base, as in the Buttercup (Fig. 341), and the Purslane (Fig. 272);

Erect, when rising upright from the very base of the cell, as in the Buckwheat (Fig. 342);

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Pendulous, when hanging from the side or from near the top, as in the Flax (Fig. 270); and

Suspended, when hanging perpendicularly from the very summit of the cell, as in the Anemone (Fig. 343). All these terms equally apply to seeds.

320. In structure an ovule is a pulpy mass of tissue, usually with one or two coats or coverings. The following parts are to be noted; viz: —

Kernel or Nucleus, the body of the ovule. In the Mistletoe and some related plants, there is only this nucleus, the coats being wanting.

Teguments, or coats, sometimes only one, more commonly two. When two, one has been called Primine, the other Secundine. It will serve all purposes to call them simply outer and inner ovule-coats.

Orifice, or Foramen, an opening through the coats at the organic apex of the ovule. In the seed it is *Micropyle*.

Chalaza, the place where the coats and the kernel of the ovule blend.

Hilum, the place of junction of the funiculus with the body of the ovule.

Fig. 340. A cluster of ovules, pendulous on their funicles.

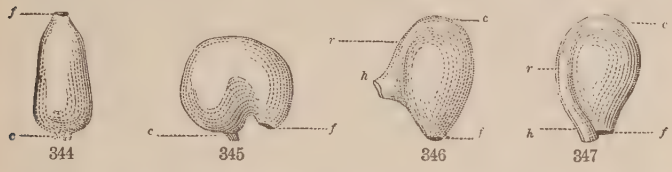
Fig. 341. Section of the ovary of a Buttercup, lengthwise, showing its ascending ovule.

Fig. 342. Section of the ovary of Buckwheat, showing the erect ovule.

Fig. 343. Section of the ovary of Anemone, showing its suspended ovule.

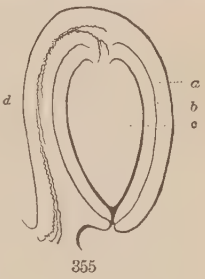
321. **The Kinds of Ovules.** The ovules in their growth develop in three or four different ways, and thereby are distinguished into

Orthotropous or *Straight*, those which develop without curving or turning, as in Fig. 344. The chalaza is at the insertion or base; the foramen or orifice is at the apex. This is the simplest, but the least common kind of ovule.



Campylotropous or *Incurved*, in which, by the greater growth of one side, the ovule curves into a kidney-shaped outline, so bringing the orifice down close to the base or chalaza; as in Fig. 345.

Amphitropous or *Half-Inverted*, Fig. 346. Here the forming ovule, instead of curving perceptibly, keeps its axis nearly straight, and, as it grows, turns round upon its base so far as to become transverse to its funiculus, and adnate to its upper part for some distance. Therefore in this case the attachment of the funiculus or stalk is about the middle, the chalaza is at one end, the orifice at the other.



Anatropous or *Inverted*, as in Fig. 347, the commonest kind, so called because in its growth it has as it were turned over upon its stalk, to which it has continued adnate. The organic base, or chalaza, thus becomes the apparent summit, and the

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Fig. 344. Orthotropous ovule of Buckwheat: *c*, hilum and chalaza; *f*, orifice.

Fig. 345. Campylotropous ovule of a Chickweed: *c*, hilum and chalaza; *f*, orifice.

Fig. 346. Amphitropous ovule of Mallow: *f*, orifice; *h*, hilum; *r*, rhaphe; *c*, chalaza.

Fig. 347. Anatropous ovule of a Violet; the parts lettered as in the last.

Fig. 348–350. Three early stages in the growth of ovule of a Magnolia, showing the forming outer and inner coats, which, even in the later figure have not yet completely enclosed the nucleus; 351, further advanced, and 352, completely anatropous ovule.

Fig. 353. Longitudinal section, and 354, transverse section of 352.

Fig. 355. Same as 353, enlarged, showing the parts in section: *a*, outer coat; *b*, inner coat; *c*, nucleus; *d*, rhaphe.

orifice is at the base, by the side of the hilum or place of attachment. The adnate portion of the funiculus, which appears as a ridge or cord extending from the hilum to the chalaza, and which distinguishes this kind of ovule, is called the RHAPHE. The amphitropous ovule (Fig. 346) has a short or incomplete rhaphe.

322. Fig. 348–352 show the stages through which an ovule becomes anatropous in the course of its growth. The annexed two figures are sections of such an ovule at maturity; and Fig. 355 is Fig. 353 enlarged, with the parts lettered.

SECTION XII. MODIFICATIONS OF THE RECEPTACLE.

323. **The Torus** or Receptacle of the flower (237, Fig. 223) is the portion which belongs to the stem or axis. In all preceding illustrations it is small and short. But it sometimes lengthens, sometimes thickens or variously enlarges, and takes on various forms. Some of these have received special names, very few of which are in common use. A lengthened portion of the receptacle is called

A STIPE. This name, which means simply a trunk or stalk, is used in

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botany for various stalks, even for the leaf-stalk in Ferns. It is also applied to the stalk or petiole of a carpel, in the rare cases when there is any, as in

FIG. 356. Longitudinal section of flower of Silene Pennsylvanica, showing stipe between calyx and corolla.

FIG. 357. Flower of a Cleome of the section Gynandropsis, showing broadened receptacle to bear petals, lengthened stipe below the stamens, and another between these and pistil.

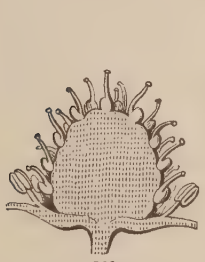
FIG. 358. Pistil of Geranium or Cranesbill.

FIG. 359. The same, ripe, with the five carpels splitting away from the long beak (carpophore), and hanging from its top by their recurving styles.

Goldthread. Then it is technically distinguished as a THECAPHORE. When there is a stalk, or lengthened internode of receptacle, directly under a compound pistil, as in Stanleya and some other Cruciferæ, it is called a GYNOPHORE. When the stalk is developed below the stamens, as in most species of Silene (Fig. 356), it has been called an ANTHOPHORE or GONOPHORE. In Fig. 357 the torus is dilated above the calyx where it bears the petals, then there is a long internode (gonophore) between it and the stamens; then a shorter one (gynophore) between these and the pistil.

324. **A Carpophore** is a prolongation of receptacle or axis between the carpels and bearing them. Umbelliferous plants and Geranium (Fig. 358, 359) afford characteristic examples.

325. Flowers with very numerous simple pistils generally have the receptacle enlarged so as to give them room; sometimes becoming broad and flat, as in the Flowering Raspberry, sometimes elongated, as in the Black-



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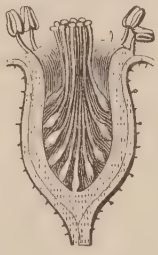

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berry, the Magnolia, etc. It is the receptacle in the Strawberry (Fig. 360), much enlarged and pulpy when ripe, which forms the eatable part of the fruit, and bears the small seed-like pistils on its surface. In the Rose (Fig. 361), instead of being convex or conical, the receptacle is deeply concave, or urn-shaped. Indeed, a Rose-hip may be likened to a strawberry turned inside out, like the finger of a glove reversed, and the whole covered by the adherent tube of the calyx. The calyx remains beneath in the strawberry.

326. In Nelumbium, of the Water-Lily family, the singular and greatly enlarged receptacle is shaped like a top, and bears the small pistils immersed in separate cavities of its flat upper surface (Fig. 362).

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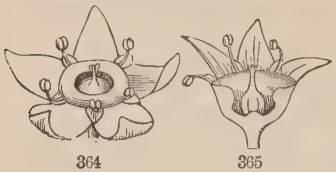
327. **A Disk** is an enlarged low receptacle or an outgrowth from it, *hypogynous* when underneath the pistil, as in Rue and the Orange (Fig. 363), and *perigynous* when adnate to calyx-tube (as in Buckthorn, Fig. 364, 365), and Cherry (Fig. 271), or

FIG. 360. Longitudinal section of a young strawberry, enlarged.
FIG. 361. Similar section of a young Rose-hip.
FIG. 362. Enlarged and top-shaped receptacle of Nelumbium, at maturity.
FIG. 363. Hypogynous disk in Orange.

to both calyx-tube and ovary, as in Hawthorn (Fig. 273). A flattened hypogynous disk, underlying the ovary or ovaries, and from which they fall away at maturity, is sometimes called a GYNOBASE, as in the Rue family. In some Borragineous flowers, such as Houndstongue, the gynobase runs up in the centre between the carpels into a carpophore. The so-called *epigynous* disk (or STYLOPODIUM) crowning the summit of the ovary in flowers of Umbelliferæ, etc., cannot be said to belong to the receptacle.



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SECTION XIII. FERTILIZATION.

328. The end of the flower is attained when the ovules become seeds. A flower remains for a certain time (longer or shorter according to the species) in *anthesis*, that is, in the proper state for the fulfilment of this end. During anthesis, the ovules have to be fertilized by the pollen; or at least some pollen has to reach the stigma, or in gymnospermy the ovule itself, and to set up the peculiar growth upon its moist and permeable tissue, which has for result the production of an embryo in the ovules. By this the ovules are said to be *fertilized*. The first step is *pollination*, or, so to say, the sowing of the proper pollen upon the stigma, where it is to germinate.

§ 1. ADAPTATIONS FOR POLLINATION OF THE STIGMA.

329. These various and ever-interesting adaptations and processes are illustrated in the "Botanical Text Book, Structural Botany," chap. VI. sect. iv., also in a brief and simple way in "Botany for Young People, How Plants Behave." So mere outlines only are given here.

330. Sometimes the application of pollen to the stigma is left to chance, as in dicœcious wind-fertilized flowers; sometimes it is rendered very sure, as in flowers that are fertilized in the bud; sometimes the pollen is prevented from reaching the stigma of the same flower, although placed very near to it, but then there are always arrangements for its transference to the stigma of some other blossom of the kind. It is among these last that the most exquisite adaptations are met with.

331. Accordingly, some flowers are particularly adapted to close or self-fertilization; others to cross fertilization; some for either, according to circumstances.

FIG. 364. Flower of a Buckthorn showing a conspicuous perigynous disk.
FIG. 365. Vertical section of same flower.

Close Fertilization occurs when the pollen reaches and acts upon a stigma of the very same flower (this is also called self-fertilization), or, less closely, upon other blossoms of the same cluster or the same individual plant.

Cross Fertilization occurs when ovules are fertilized by pollen of other individuals of the same species.

Hybridization occurs when ovules are fertilized by pollen of some other (necessarily some nearly related) species.

332. **Close Fertilization** would seem to be the natural result in ordinary hermaphrodite flowers; but it is by no means so in all of them. More commonly the arrangements are such that it takes place only after some opportunity for cross fertilization has been afforded. But close fertilization is inevitable in what are called

Cleistogamous Flowers, that is, in those which are fertilized in the flower-bud, while still unopened. Most flowers of this kind, indeed, never open at all; but the closed floral coverings are forced off by the growth of the precociously fertilized pistil. Common examples of this are found in the earlier blossoms of Specularia perfoliata, in the later ones of most Violets, especially the stemless species, in our wild Jewel weeds or Impatiens, in the subterranean shoots of Amphicarpæa. Every plant which produces these cleistogamous or bud-fertilized flowers bears also more conspicuous and open flowers, usually of bright colors. The latter very commonly fail to set seed, but the former are prolific.

333. **Cross Fertilization** is naturally provided for in dicœcious plants (249), is much favored in monœcious plants (249), and hardly less so in dichogamous and in heterogonous flowers (338). Cross fertilization depends upon the transportation of pollen; and the two principal agents of conveyance are winds and insects. Most flowers are in their whole structure adapted either to the one or to the other.

334. **Wind-fertilizable or Anemophilous** flowers are more commonly dicœcious or monœcious, as in Pines and all coniferous trees, Oaks, and Birches, and Sedges; yet sometimes hermaphrodite, as in Plantains and most Grasses; they produce a superabundance of very light pollen, adapted to be wind-borne; and they offer neither nectar to feed winged insects, nor fragrance nor bright colors to attract them.

335. **Insect-fertilizable or Entomophilous** flowers are those which are sought by insects, for pollen or for nectar, or for both. Through their visits pollen is conveyed from one flower and from one plant to another. Insects are attracted to such blossoms by their bright colors, or their fragrance, or by the nectar (the material of honey) there provided for them. While supplying their own needs, they carry pollen from anthers to stigmas and from plant to plant, thus bringing about a certain amount of cross fertilization. Willows and some other dicœcious flowers are so fertilized, chiefly by bees. But most insect-visited flowers have the stamens and pistils associated either in the same or in contiguous blossoms. Even when in the same blossom, anthers and stigmas are very commonly so situated

that under insect-visitation, some pollen is more likely to be deposited upon other than upon own stigmas, so giving a chance for cross as well as for close fertilization. On the other hand, numerous flowers, of very various kinds, have their parts so arranged that they must almost necessarily be cross-fertilized or be barren, and are therefore dependent upon the aid of insects. This aid is secured by different exquisite adaptations and contrivances, which would need a volume for full illustration. Indeed, there is a good number of volumes devoted to this subject.[1]

336. Some of the adaptations which favor or ensure cross fertilization are peculiar to the particular kind of blossom. Orchids, Milkweeds, Kalmia, Iris, and papilionaceous flowers each have their own special contrivances, quite different for each.

337. Irregular flowers (253) and especially irregular corollas are usually adaptations to insect-visitation. So are all *Nectaries*, whether hollow spurs, sacs, or other concavities in which nectar is secreted, and all *nectariferous glands*.

338. Moreover, there are two arrangements for cross fertilization common to hermaphrodite flowers in various different families of plants, which have received special names, *Dichogamy* and *Heterogony*.

339. **Dichogamy** is the commoner case. Flowers are *dichogamous* when the anthers discharge their pollen either before or after the stigmas of that flower are in a condition to receive it. Such flowers are

Proterandrous, when the anthers are earlier than the stigmas, as in Gentians, Campanula, Epilobium, etc.

Proterogynous, when the stigmas are mature and moistened for the reception of pollen, before the anthers of that blossom are ready to supply it, and are withered before that pollen can be supplied. Plantains or Ribworts (mostly wind-fertilized) are strikingly proterogynous: so is Amorpha, our Papaws, Scrophularia, and in a less degree the blossom of Pears, Hawthorns, and Horse-chestnut.

340. In Sabbatia, the large-flowered species of Epilobium, and strikingly in Clerodendron, the dichogamy is supplemented and perfected by movements of the stamens and style, one or both, adjusted to make sure of cross fertilization.

341. **Heterogony.** This is the case in which hermaphrodite and fertile flowers of two sorts are produced on different individuals of the same species; one sort having higher anthers and lower stigmas, the other having higher stigmas and lower anthers. Thus reciprocally disposed, a visiting insect carries pollen from the high anthers of the one to the high stigma of the other, and from the low anthers of the one to the low stigma of the other. These plants are practically as if dicœcious, with the advantage that

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[1] Beginning with one by C. C. Sprengel in 1793, and again in our day with Darwin, "On the Various Contrivances by which Orchids are fertilized by Insects," and in succeeding works.

both kinds are fruitful. Houstonia and Mitchella, or Partridge-berry, are excellent and familiar examples. These are cases of

Heterogone Dimorphism, the relative lengths being only short and long reciprocally.

Heterogone Trimorphism, in which there is a mid-length as well as a long and a short set of stamens and style; occurs in Lythrum Salicaria and some species of Oxalis.

342. There must be some essential advantage in cross fertilization or cross breeding. Otherwise all these various, elaborate, and exquisitely adjusted adaptations would be aimless. Doubtless the advantage is the same as that which is realized in all the higher animals by the distinction of sexes.

§ 2. ACTION OF POLLEN, AND FORMATION OF THE EMBRYO.

343. **Pollen-growth.** A grain of pollen may be justly likened to one of the simple bodies (*spores*) which answer for seeds in Cryptogamous plants. Like one of these, it is capable of germination. When deposited upon the moist surface of the stigma (or in some cases even when at a certain distance) it grows from some point, its living inner coat breaking through the inert outer coat, and protruding in the form of a delicate tube. This as it lengthens penetrates the loose tissue of the stigma and of a loose conducting tissue in the style, feeds upon the nourishing liquid matter there provided, reaches the cavity of the ovary, enters the orifice of an ovule, and attaches its extremity to a sac, or the lining of a definite cavity, in the ovule, called the *Embryo-Sac*.

344. **Origination of the Embryo.** A globule of living matter in the embryo-sac is formed, and is in some way placed in close proximity to the apex of the pollen tube; it probably absorbs the contents of the latter; it then sets up a special growth, and the *Embryo* (8–10) or rudimentary plantlet in the seed is the result.

SECTION XIV. THE FRUIT.

345. **Its Nature.** The ovary matures into the Fruit. In the strictest sense the fruit is the seed-vessel, technically named the PERICARP. But practically it may include other parts organically connected with the pericarp. Especially the calyx, or a part of it, is often incorporated with the ovary, so as to be undistinguishably a portion of the pericarp, and it even forms along with the receptacle the whole bulk of such edible fruits as apples and pears. The receptacle is an obvious part in blackberries, and is the whole edible portion in the strawberry.

346. Also a cluster of distinct carpels may, in ripening, be consolidated or compacted, so as practically to be taken for one fruit. Such are raspber

ries, blackberries, the Magnolia fruit, etc. Moreover, the ripened product of many flowers may be compacted or grown together so as to form a single compound fruit.

347. Its kinds have therefore to be distinguished. Also various names of common use in descriptive botany have to be mentioned and defined.

348. In respect to composition, accordingly, fruits may be classified into

Simple, those which result from the ripening of a single pistil, and consist only of the matured ovary, either by itself, as in a cherry, or with calyx-tube completely incorporated with it, as in a gooseberry or cranberry.

Aggregate, when a cluster of carpels of the same flower are crowded into a mass; as in raspberries and blackberries.

Accessory or *Anthocarpous*, when the surroundings or supports of the pistil make up a part of the mass; as does the loose calyx changed into a fleshy and berry-like envelope of our Wintergreen (Gaultheria, Fig. 366, 367) and Buffaloberry, which are otherwise simple fruits. In an aggregate fruit such as the strawberry the great mass is receptacle (Fig. 360, 368); and in the blackberry (Fig. 369) the juicy receptacle forms the central part of the savory mass.

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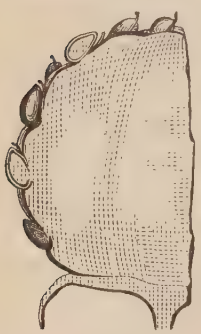
Multiple or *Collective*, when formed from several flowers consolidated into one mass, of which the common receptacle or axis of inflorescence, the floral envelopes, and even the bracts, etc., make a part. A mulberry (Fig. 408, which superficially much resembles a blackberry) is of this multiple sort. A pineapple is another example.



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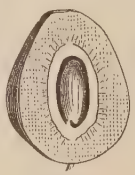

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349. In respect to texture or consistence, fruits may be distinguished into three kinds, viz.: —

Fleshy Fruits, those which are more or less soft and juicy throughout;

Fig. 366. Forming fruit (capsule) of Gaultheria, with calyx thickening around its base. 367. Section of same mature, the berry-like calyx nearly enclosing the capsule.

Fig. 368. Section of a part of a strawberry. Compare with Fig. 360.

Fig. 369. Similar section of part of a blackberry. 370. One of its component simple fruits (drupe) in section, showing the pulp, stone, and contained seed, more enlarged. Compare with Fig. 375.

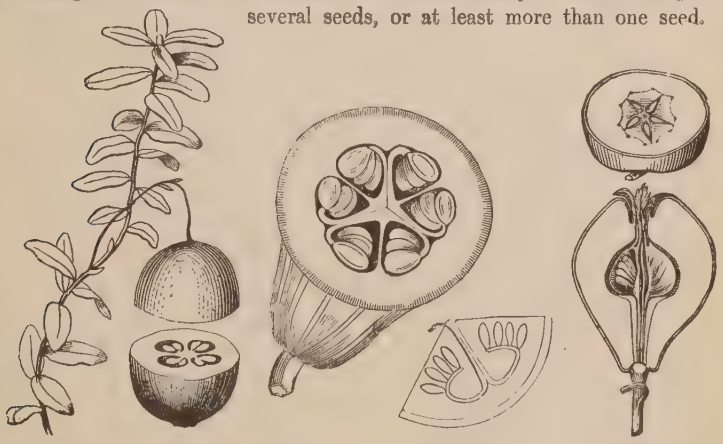
Stone Fruits, or *Drupaceous*, the outer part fleshy like a berry, the inner hard or stony, like a nut; and

Dry Fruits, those which have no flesh or pulp.

350. In reference to the way of disseminating the contained seed, fruits are said to be

Indehiscent when they do not open at maturity. Fleshy fruits and stone fruits are of course indehiscent. The seed becomes free only through decay or by being fed upon by animals. Those which escape digestion are thus disseminated by the latter. Of dry fruits many are indehiscent; and these are variously arranged to be transported by animals. Some burst irregularly; many are

Dehiscent, that is, they split open regularly along certain lines, and discharge the seeds. A dehiscent fruit almost always contains many or several seeds, or at least more than one seed.



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351. The principal kinds of fruit which have received substantive names and are of common use in descriptive botany are the following. Of fleshy fruits the leading kind is

352. **The Berry**, such as the gooseberry and currant, the blueberry and cranberry (Fig. 371), the tomato, and the grape. Here the whole flesh is soft throughout. The orange is a berry with a leathery rind.

353. **The Pepo**, or *Gourd-fruit*, is a hard-rinded berry, belonging to the Gourd family, such as the pumpkin, squash, cucumber, and melon, Fig. 372, 373.

354. **The Pome** is a name applied to the apple, pear (Fig. 374), and quince; fleshy fruits, like a berry, but the principal thickness is calyx, only

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FIG. 371. Leafy shoot and berry (cut across) of the larger Cranberry, Vaccinium macrocarpon

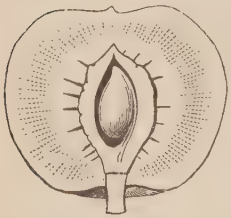
FIG. 372. Pepo of Gourd, in section. 373. One carpel of same in diagram.

FIG. 374. Longitudinal and transverse sections of a pear (pome).

the papery pods arranged like a star in the core really belonging to the carpels. The fruit of the Hawthorn is a drupaceous pome, something between pome and drupe.

355. Of fruits which are externally fleshy and internally hard the leading kind is

356. **The Drupe**, or *Stone-fruit;* of which the cherry, plum, and peach (Fig. 375) are familiar examples. In this the outer part of the thickness of the pericarp becomes fleshy, or softens like a berry, while the inner hardens, like a nut. From the way in which the pistil is constructed, it is evident that the fleshy part here answers to the lower, and the stone to the upper face of the component leaf. The layers or concentric portions of a drupe, or of any pericarp which is thus separable, are named, when thus distinguishable into three portions, —



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Epicarp, the external layer, often the mere skin of the fruit,

Mesocarp, the middle layer, which is commonly the fleshy part, and

Endocarp, the innermost layer, the stone. But more commonly only two portions of a drupe are distinguished, and are named, the outer one

Sarcocarp or *Exocarp*, for the flesh, the first name referring to the fleshy character, the second to its being an external layer; and

Putamen or *Endocarp*, the *Stone*, within.

357. The typical or true drupe is of a single carpel. But, not to multiply technical names, this name is extended to all such fruits when fleshy without and stony within, although of compound pistil, — even to those having several or separable stones, such as the fruit of Holly. These stones in such drupes, or drupaceous fruits, are called *Pyrenæ*, or *Nucules*, or simply *Nutlets* of the drupe.

358. Of Dry fruits, there is a greater diversity of kinds having distinct names. The indehiscent sorts are commonly one-seeded.

359. **The Akene or Achenium** is a small, dry and indehiscent one-seeded fruit, often so seed-like in appearance that it is popularly taken for a naked seed. The fruit of the Butter cup or Crowfoot is a good example, Fig. 376, 377. Its nature, as a ripened pistil (in this

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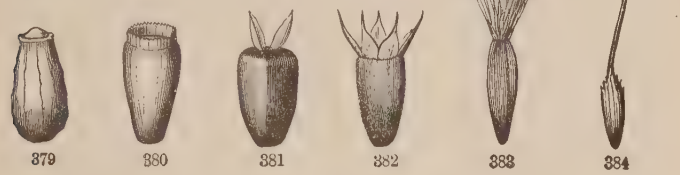
Fig. 375. Longitudinal section of a peach, showing flesh, stone, and seed.

Fig. 376. Akene of a Buttercup. 377. The same, divided lengthwise, to show the contained seed.

Fig. 378. Akene of Virgin's-bower, retaining the feathered style, which aids in dissemination.

case a simple carpel), is apparent by its bearing the remains of a style or stigma, or a scar from which this has fallen. It may retain the style and use it in various ways for dissemination (Fig. 378).

360. The fruit of Compositæ (though not of a single carpel) is also an akene. In this case the pericarp is invested by an adherent calyx-tube; the limb of which, when it has any, is called the PAPPUS. This name was first given to the down like that of the Thistle, but is applied to all forms under which the limb of the calyx of the "compound flower" appears. In Lettuce, Dandelion (Fig. 384), and the like, the achenium as it matures tapers upwards into a slender beak, like a stalk to the pappus.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361. **A Cremocarp** (Fig. 385), a name given to the fruit of Umbelliferæ, consists as it were of a pair of akenes united completely in the blossom, but splitting apart when ripe into the two closed carpels. Each of these is a *Mericarp* or *Hemicarp*, names seldom used.

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362. **A Utricle** is the same as an akene, but with a thin and bladdery loose pericarp; like that of the Goosefoot or Pigweed (Fig. 386). When ripe it may burst open irregularly to discharge the seed; or it may open by a circular line all round, the upper part falling off like a lid; as in the Amaranth (Fig. 387).

387

363. **A Caryopsis, or Grain**, is like an akene with the seed adhering to the thin pericarp throughout, so that fruit and seed are incorporated into one body; as in wheat, Indian corn, and other kinds of grain.

364. **A Nut** is a dry and indehiscent fruit, commonly one-celled and one-

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FIG. 379. Akene of Mayweed (no pappus). 380. That of Succory (its pappus a shallow cup). 381. Of Sunflower (pappus of two deciduous scales). 382. Of Sneezeweed (Helenium), with its pappus of five scales. 383. Of Sow-Thistle, with its pappus of delicate downy hairs. 384. Of the Dandelion, its pappus raised on a long beak.

FIG. 385. Fruit (cremocarp) of Osmorrhiza; the two akene-like ripe carpels separating at maturity from a slender axis or carpophorse.

FIG. 386. Utricle of the common Pigweed (Chenopodium album).

FIG. 387. Utricle (pyxis) of Amaranth, opening all round (circumscissile).

seeded, with a hard, crustaceous, or bony wall, such as the cocoanut, hazel-nut, chestnut, and the acorn (Fig. 37, 388.) Here the involucre, in the form of a cup at the base, is called the CUPULE. In the Chestnut the cupule forms the bur; in the Hazel, a leafy husk.

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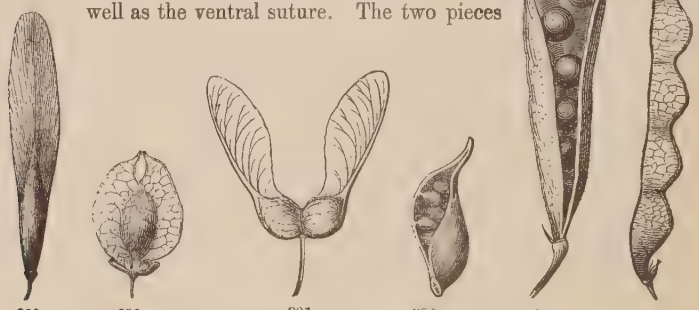
365. **A Samara, or Key-fruit**, is either a nut or an akene, or any other indehiscent fruit, furnished with a wing, like that of Ash (Fig. 389), and Elm (Fig. 390). The Maple-fruit is a pair of keys (Fig. 391).

366. Dehiscent Fruits, or Pods, are of two classes, viz., those of a simple pistil or carpel, and those of a compound pistil. Two common sorts of the first are named as follows: —

367. **The Follicle** is a fruit of a simple carpel, which dehisces down one side only, i. e. by the inner or ventral suture. The fruits of Marsh Marigold (Fig. 392), Pæony, Larkspur, and Milkweed are of this kind.

368. **The Legume** or true Pod, such as the peapod (Fig. 393), and the fruit of the Leguminous or Pulse family generally, is one which opens along the dorsal as well as the ventral suture. The two pieces into which it splits are called VALVES. A LOMENT is a legume which is constricted between the seeds, and at length breaks up crosswise into distinct joints, as in Fig. 394.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369. The pods or dehiscent fruits belonging to a compound ovary have several technical names: but they all may be regarded as kinds of

370. **The Capsule**, the dry and dehiscent fruit of any compound pistil. The capsule may discharge its seeds through chinks or pores, as in the

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FIG. 388. Nut (acorn) of the Oak, with its cup or cupule.

FIG. 389. Samara or key of the White Ash, winged at end. 390. Samara of the American Elm, winged all round.

FIG. 391. Pair of samaras of Sugar Maple.

FIG. 392. Follicle of Marsh Marigold (Caltha palustris).

FIG. 393. Legume of a Sweet Pea, opened.

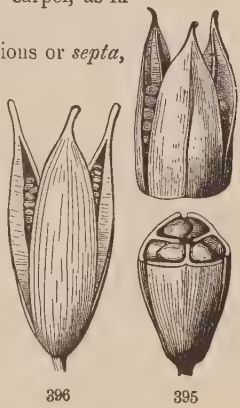
FIG. 394. Loment or jointed legume of a Tick-Trefoil (Desmodium).

Poppy, or burst irregularly in some part, as in Lobelia and the Snapdragon; but commonly it splits open (or is *dehiscent*) lengthwise into regular pieces, called VALVES.

371. Regular *Dehiscence* in a capsule takes place in two ways, which are best illustrated in pods of two or three cells. It is either

Loculicidal, or, splitting directly into the *loculi* or cells, that is, down the back (or the dorsal suture) of each cell or carpel, as in Iris (Fig. 395); or

Septicidal, that is, splitting through the partitions or *septa*, as in St. John's-wort (Fig. 396), Rhododendron, etc. This divides the capsule into its component carpels, which then open by their ventral suture.



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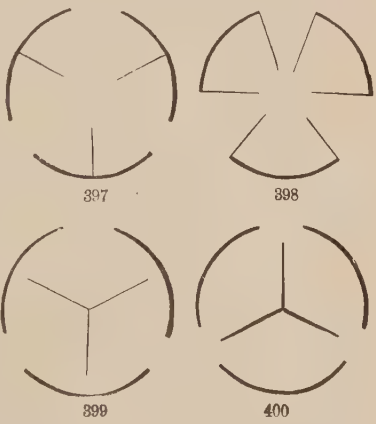
372. In loculicidal dehiscence the valves naturally bear the partitions on their middle; in the septicidal, half the thickness of a partition is borne on the margin of each valve. See the annexed diagrams. A variation of either mode occurs when the valves break away from the partitions, these remaining attached in the axis of the fruit. This is called *Septifragal* dehiscence. One form is seen in the Morning-Glory (Fig. 400).

373. The capsules of Rue, Spurge, and some others, are both loculicidal and septicidal, and so split into half-carpellary valves or pieces.



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374. **The Silique** (Fig. 401) is the technical name of the peculiar pod of the Mustard family; which is two-celled by a false partition stretched across between two parietal placentæ. It generally opens by two valves from below upward, and the placentæ with the partition are left behind when the valves fall off.

375. **A Silicle or Pouch** is only a short and broad silique, like that of the Shepherd's Purse, Fig. 402, 403.

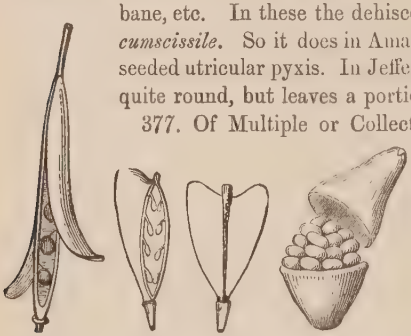
FIG. 395. Capsule of Iris, with loculicidal dehiscence; below, cut across.

FIG. 396. Pod of a Marsh St. John's-wort, with septicidal dehiscence.

FIG. 397, 398. Diagrams of the two modes.

FIG. 399. Diagram of septifragal dehiscence of the loculicidal type. 400. Diagram of the septicidal or *marginicidal* type.

376. **The Pyxis** is a pod which opens by a circular horizontal line, the upper part forming a lid, as in Purslane (Fig. 404), the Plantain, Henbane, etc. In these the dehiscence extends all round, or is *circumscissile*. So it does in Amaranth (Fig. 387), forming a one-seeded utricular pyxis. In Jeffersonia, the line does not separate quite round, but leaves a portion for a hinge to the lid.



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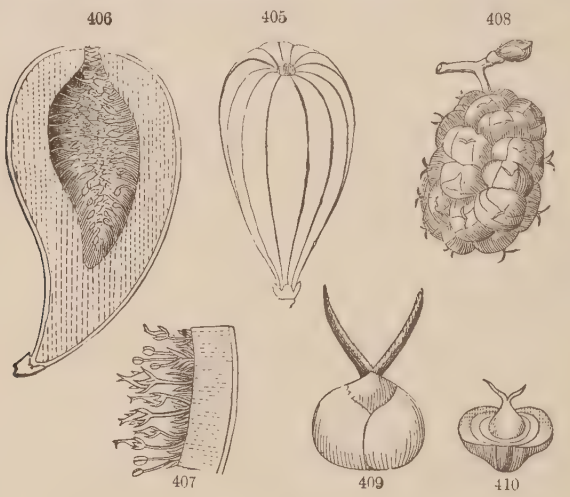
377. Of Multiple or Collective Fruits, which are properly masses of fruits aggregated into one body (as is seen in the Mulberry (Fig. 408), Pine-apple, etc.), there are two kinds with special names and of peculiar structure.

378. **The Syconium or Fig-fruit** (Fig. 405, 406) is a fleshy axis or summit of stem, hollowed out, and lined within by a multitude of minute flowers, the whole becoming pulpy, and in the common fig, luscious



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379. **The Strobile or Cone** (Fig. 411), is the peculiar multiple fruit of Pines, Cypresses, and the like; hence named *Coniferæ*, viz. cone-bearing

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Fig. 401. Silique of a Cadamine or Spring Cress.

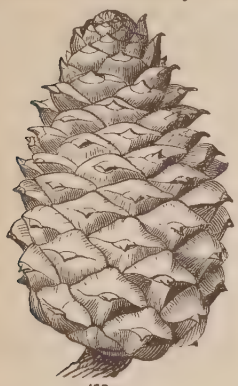
Fig. 402. Silicle of Shepherd's Purse. 403. Same, with one valve removed.

Fig. 404. Pyxis of Purslane, the lid detaching.

Fig. 405. A fig-fruit when young. 406. Same in section. 407. Magnified portion, a slice, showing some of the flowers.

Fig. 408. A mulberry. 409. One of the grains younger, enlarged; seen to be a pistillate flower with calyx becoming fleshy. 410. Same, with fleshy calyx cut across.

plants. As already shown (313), these cones are *open pistils*, mostly in the form of flat scales, regularly overlying each other, and pressed together in a spike or head. Each scale bears one or two naked seeds on its inner face. When ripe and dry, the scales turn back or diverge, and in the Pine the seed peels off and falls, generally carrying with it a wing, a part of the lining of the scale, which facilitates the dispersion of the seeds by the wind (Fig. 412, 413). In Arbor-Vitæ, the scales of the small cone are few, and not very unlike the leaves. In Cypress they are very thick at the top and narrow at the base, so as to make a peculiar sort of closed cone. In Juniper and Red Cedar, the few scales of the very small cone become fleshy, and ripen into a fruit which closely resembles a berry.



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Section XV. THE SEED.

380. Seeds are the final product of the flower, to which all its parts and offices are subservient. Like the ovule from which it originates, a seed consists of coats and kernel.

381. **The Seed-coats** are commonly two (320), the outer and the inner. Fig. 414 shows the two, in a seed cut through lengthwise. The outer coat is often hard or crustaceous, whence it is called the *Testa*, or shell of the seed; the inner is almost always thin and delicate.

414

382. The shape and the markings, so various in different seeds, depend mostly on the outer coat. Sometimes this fits the kernel closely; sometimes it is expanded into a *wing*, as in the Trumpet-Creeper (Fig. 415), and occasionally this wing is cut up into shreds or tufts, as in the Catalpa (Fig. 416); or instead of a wing it may bear a *Coma*, or tuft of long and soft hairs, as in the Milkweed or Silkweed (Fig. 417). The use of wings, or downy tufts is to render the seeds buoyant

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Fig. 411. Cone of a common Pitch Pine. 412. Inside view of a separated scale or open carpel; one seed in place: 413, the other seed.

Fig. 414. Seed of a Linden or Basswood cut through lengthwise, and magnified, the parts lettered: *a*, the hilum or scar; *b*, the outer coat; *c*, the inner; *d*, the albumen; *e*, the embryo.

for dispersion by the winds. This is clear, not only from their evident adaptation to this purpose, but also from the fact that winged and tufted seeds are found only in fruits that split open at maturity, never in those that remain closed. The coat of some seeds is beset with long hairs or wool. *Cotton*, one of the most important vegetable products, since it forms the principal clothing of the

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larger part of the human race, consists of the long and woolly hairs which thickly cover the whole surface of the seed. There are also crests or other appendages of various sorts on certain seeds. A few seeds have an additional, but more or less incomplete covering, outside of the real seed-coats called an

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383. **Aril, or Arillus.** The loose and transparent bag which encloses the seed of the White Water-Lily (Fig. 418) is of this kind. So is the *mace* of the nutmeg; and also the scarlet pulp around the seeds of the Waxwork (Celastrus) and Strawberry-bush (Euonymus). The aril is a growth from the extremity of the seed-stalk, or from the placenta when there is no seed-stalk.

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384. A short and thickish appendage at or close to the hilum in certain seeds is called a CARUNCLE or STROPHIOLE (Fig. 419).

385. The various terms which define the position or direction of the ovule (erect, ascending, etc.) apply equally to the seed: so also the terms anatropous, orthotropous, campylotropous, etc., as already defined (320, 321), and such terms as

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HILUM, or *Scar* left where the seed-stalk or funiculus falls away, or where the seed was attached directly to the placenta when there is no seed-stalk.

RHAPHE, the line or ridge which runs from the hilum to the chalaza in anatropous and amphitropous seeds.

CHALAZA, the place where the seed-coats and the kernel or nucleus are organically connected, — at the hilum in orthotropous and campylotropous seeds, at the extremity of the rhaphe or tip of the seed in other kinds.

MICROPYLE, answering to the *Foramen* or orifice of the ovule. Compare the accompanying figures and those of the ovules, Fig. 341–355.

FIG. 415. A winged seed of the Trumpet-Creeper.

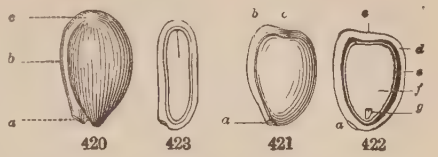
FIG. 416. One of Catalpa, the kernel cut to show the embryo.

FIG. 417. Seed of Milkweed, with a *Coma* or tuft of long silky hairs at one end.

FIG. 418. Seed of White Water-Lily, enclosed in its aril.

FIG. 419. Seed of Ricinus or Castor-oil plant, with caruncle.

386. **The Kernel, or Nucleus,** is the whole body of the seed within the coats. In many seeds the kernel is all *Embryo;* in others a large part of it is the *Albumen.* For example, in Fig. 423, it is wholly embryo; in Fig. 422, all but the small speck (*g*) is albumen.



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387. The Albumen or Endosperm of the seed is sufficiently characterized and its office explained in Sect. III., 31–35.

388. **The Embryo** or *Germ,* which is the rudimentary plantlet and the final result of blossoming, and its development in germination have been extensively illustrated in Sections II. and III. Its essential parts are the *Radicle* and the *Cotyledons.*

389. **Its Radicle or Caulicle** (the former is the term long and generally used in botanical descriptions, but the latter is the more correct one, for it is the initial stem, which merely gives origin to the root), as to its position in the seed, always points to and lies near the micropyle. In relation to the pericarp it is

Superior, when it points to the apex of the fruit or cell, and

Inferior, when it points to its base, or downward.

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390. **The Cotyledons** have already been illustrated as respects their number, — giving the important distinction of *Dicotyledonous, Polycotyledonous* and *Monocotyledonous* embryos (36–43), — also as regards their thickness, whether *foliaceous* or *fleshy;* and some of the very various shapes and adaptations to the seed have been figured. They may be straight, or folded, or rolled up. In the latter case the cotyledons may be rolled up as it were from one margin, as in Calycanthus (Fig. 424), or from apex to base in a flat spiral, or they may be both folded (*plicate*) and rolled up (*convolute*), as in Sugar Maple (Fig. 11.) In one very natural family, the Cruciferæ, two different modes prevail in the way the two cotyledons are brought round against the radicle. In one series they are

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Fig. 420. Seed of a Violet (anatropous): *a*, hilum; *b*, rhaphe; *c*, chalaza.

Fig. 421. Seed of a Larkspur (also anatropous); the parts lettered as in the last.

Fig. 422. The same, cut through lengthwise: *a*, the hilum; *c*, chalaza; *d*, outer seed-coat; *e*, inner seed-coat; *f*, the albumen; *g*, the minute embryo.

Fig. 423. Seed of a St. John's-wort, divided lengthwise; here the whole kernel is embryo.

Fig. 424. Embryo of Calycanthus; upper part cut away, to show the convolute cotyledons.

Fig. 425. Seed of Bitter Cress, Barbarea, cut across to show the accumbent cotyledons. 426. Embryo of same, whole.

Accumbent, that is, the edges of the flat cotyledons lie against the radicle, as in Fig. 425, 426. In another they are

Incumbent, or with the plane of the cotyledons brought up in the opposite direction, so that the back of one of them lies against the radicle, as shown in Fig. 427, 428.

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391. As to the situation of the embryo with respect to the albumen of the seed, when this is present in any quantity, the embryo may be *Axile*, that is occupying the axis or centre, either for most of its length, as in Violet (Fig. 429), Barberry (Fig. 48), and Pine (Fig. 56); and in these it is straight. But it may be variously curved or coiled in the albumen, as in Helianthemum (Fig. 430), in a Potato-seed (Fig. 50), or Onion-seed (Fig. 60), and Linden (Fig. 414); or it may be coiled around the outside of the albumen, partly or into a circle, as in Chickweed (Fig. 431, 432) and in Mirabilis (Fig. 52). The latter mode prevails in Campylotropous seeds. In the cereal grains, such as Indian Corn (Fig. 67) and Rice, 430 *a*), and in all other Grasses, the embryo is straight and applied to the outside of the abundant albumen.

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430 *a*

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392. The matured seed, with embryo ready to germinate and reproduce the kind, completes the cycle of the vegetable life in a phanerogamous plant, the account of which began with the seed and seedling.

Section XVI. VEGETABLE LIFE AND WORK.

393. The following simple outlines of the anatomy and physiology of plants (3) are added to the preceding structural part for the better preparation of students in descriptive and systematic botany; also to give to all learners some general idea of the life, growth, intimate structure, and action of the beings which compose so large a part of organic nature. Those who would extend and verify the facts and principles here outlined will use the Physiological Botany of the "Botanical Text Book," by Professor Goodale, or some similar book.

Fig. 427. Seed of a Sisymbrium, cut across to show the incumbent cotyledons. 428. Embryo of the same, detached whole.

Fig. 429. Section of seed of Violet; anatropous with straight axile embryo in the albumen. 430. Section of seed of Rock Rose, Helianthemum Canadense; orthotropous, with curved embryo in the albumen. 430 *a*. Section of a grain of Rice, lengthwise, showing the embryo outside the albumen, which forms the principal bulk.

Fig. 431. Seed of a Chickweed, campylotropous. 432. Section of same, showing slender embryo coiled around the outside of the albumen of the kernel

§ 1. ANATOMICAL STRUCTURE AND GROWTH.

394. **Growth** *is the increase of a living thing in size and substance.* It appears so natural that plants and animals should grow, that one rarely thinks of it as requiring explanation. It seems enough to say that a thing is so because it grew so. Growth from the seed, the germination and development of an embryo into a plantlet, and at length into a mature plant (as illustrated in Sections II. and III.), can be followed by ordinary observation. But the embryo is already a miniature plantlet, sometimes with hardly any visible distinction of parts, but often one which has already made very considerable growth in the seed. To investigate the formation and growth of the embryo itself requires well-trained eyes and hands, and the expert use of a good compound microscope. So this is beyond the reach of a beginner.

395. Moreover, although observation may show that a seedling, weighing only two or three grains, may double its bulk and weight every week of its early growth, and may in time produce a huge amount of vegetable matter, it is still to be asked what this vegetable matter is, where it came from, and by what means plants are able to increase and accumulate it, and build it up into the fabric of herbs and shrubs and lofty trees.

396. **Protoplasm.** All this fabric was built up under life, but only a small portion of it is at any one time alive. As growth proceeds, life is passed on from the old to the new parts, much as it has passed on from parent to offspring, from generation to generation in unbroken continuity. *Protoplasm* is the common name of that plant-stuff in which life essentially resides. All growth depends upon it; for it has the peculiar power of growing and multiplying and building up a living structure, — the animal no less than the vegetable structure, for it is essentially the same in both. Indeed, all the animal protoplasm comes primarily from the vegetable, which has the prerogative of producing it; and the protoplasm of plants furnishes all that portion of the food of animals which forms their flesh and living fabric.

397. The very simplest plants (if such may specifically be called plants rather than animals, or one may say, the simplest living things) are mere particles, or pellets, or threads, or even indefinite masses of protoplasm of vague form, which possess powers of motion or of changing their shape, of imbibing water, air, and even other matters, and of assimilating these into plant-stuff for their own growth and multiplication. Their growth is increase in substance by incorporation of that which they take in and assimilate. Their multiplication is by spontaneous division of their substance or body into two or more, each capable of continuing the process.

398. The embryo of a phanerogamous plant at its beginning (344) is essentially such a globule of protoplasm, which soon constricts itself into two and more such globules, which hold together inseparably in a row; then the last of the row divides without separation in the two other planes, to

form a compound mass, each grain or globule of which goes on to double itself as it grows; and the definite shaping of this still increasing mass builds up the embryo into its form.

399. **Cell-walls.** While this growth was going on, each grain of the forming structure formed and clothed itself with a coat, thin and transparent, of something different from protoplasm, — something which hardly and only transiently, if at all, partakes of the life and action. The protoplasm forms the living organism; the coat is a kind of protective covering or shell. The protoplasm, like the flesh of animals which it gives rise to, is composed of four chemical elements: Carbon, Hydrogen, Oxygen, and Nitrogen. The coating is of the nature of wood (is, indeed, that which makes wood), and has only the three elements, Carbon, Hydrogen, and Oxygen, in its composition.

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400. Although the forming structure of an embryo in the fertilized ovule is very minute and difficult to see, there are many simple plants of lowest grade, abounding in pools of water, which more readily show the earlier stages or simplest states of plant-growth. One of these, which is common in early spring, requires only moderate magnifying power to bring to view what is shown in Fig. 437. In a slimy mass which holds all loosely together, little spheres of green vegetable matter are seen, assembled in fours, and these fours themselves in clusters of fours. A transient inspection shows, what prolonged watching would confirm, that each sphere divides first in one plane, then in the other, to make four, soon acquiring the size of the original, and so on, producing successive groups of fours. These pellets each form on their surface a transparent wall, like that just described. The delicate wall is for some time capable of expansive growth, but is from the first much firmer than the protoplasm within; through it the latter imbibes surrounding moisture, which becomes a watery sap, occupying vacuities in the protoplasmic mass which enlarge or run together as the periphery increases and distends. When full grown the protoplasm may become a mere lining to the wall, or some of it central, as a nucleus, this usually connected with the wall-lining by delicate threads of the same substance. So, when full grown, the wall with its lining — a vesicle, containing liquid or some

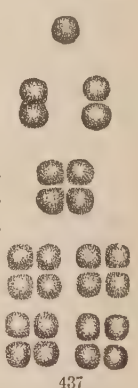
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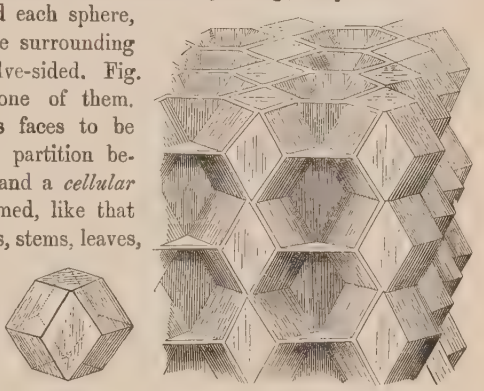
FIG. 433–436. Figures to illustrate the earlier stages in the formation of an embryo; a single mass of protoplasm (Fig. 433) dividing into two, three, and then into more incipient cells, which by continued multiplication build up an embryo.

FIG. 437. Magnified view of some of a simple fresh water Alga, the Tetraspora lubrica, each sphere of which may answer to an individual plant.

solid matters and in age mostly air — naturally came to be named a CELL. But the name was suggested by, and first used only for, cells in combination or built up into a fabric, much as a wall is built of bricks, that is, into a

401. Cellular Structure or Tissue. Suppose numerous cells like those of Fig. 437 to be heaped up like a pile of cannon-balls, and as they grew, to be compacted together while soft and yielding; they would flatten where they touched, and each sphere, being touched by twelve surrounding ones would become twelve-sided. Fig. 438 would represent one of them. Suppose the contiguous faces to be united into one wall or partition between adjacent cavities, and a *cellular structure* would be formed, like that shown in Fig. 439. Roots, stems, leaves, and the whole of phanerogamous plants are a fabric of countless numbers of such cells. No such exact regularity in size and shape is ever actually found; but a nearly truthful magnified view of a small portion of a slice of the flower-stalk of a Calla Lily (Fig. 440) shows a fairly corres



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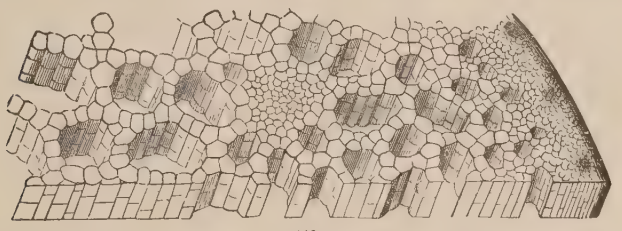

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ponding structure; except that, owing to the great air-spaces of the interior, the fabric may be likened rather to a stack of chimneys than to a solid fabric. In young and partly transparent parts one may discern the cellular structure by looking down directly on the surface, as of a forming root. (Fig. 82, 441, 442).

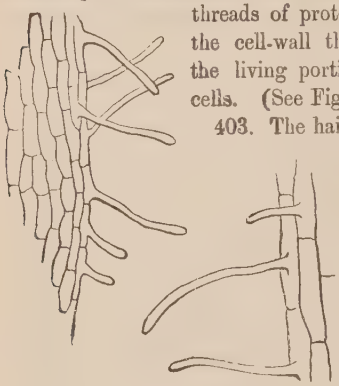
402. The substance of which cell-walls are mainly composed is called CELLULOSE. It is essentially the same in the stem of a delicate leaf or petal and in the wood of an Oak, except that in the latter the walls are

FIG. 438. Diagram of a vegetable cell, such as it would be if when spherical it were equally pressed by similar surrounding cells in a heap.

FIG. 439. Ideal construction of cellular tissue so formed, in section.

FIG. 440. Magnified view of a portion of a transverse slice of stem of Calla Lily. The great spaces are tubular air-channels built up by the cells.

much thickened and the calibre small. The protoplasm of each living cell appears to be completely shut up and isolated in its shell of cellulose; but microscopic investigation has brought to view, in many cases, minute threads of protoplasm which here and there traverse the cell-wall through minute pores, thus connecting the living portion of one cell with that of adjacent cells. (See Fig. 447, &c.)



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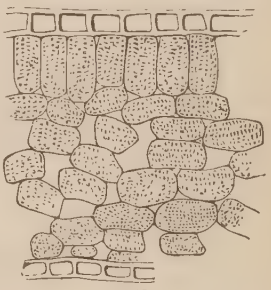
403. The hairs of plants are cells formed on the surface; either elongated single cells (like the root-hairs of Fig. 441, 442), or a row of shorter cells. Cotton fibres are long and simple cells growing from the surface of the seed.

404. The size of the cells of which common plants are made up varies from about the thirtieth to the thousandth of an inch in diameter. An ordinary size of short or roundish cells is from $\frac{1}{300}$ to $\frac{1}{500}$ of an inch; so that there may generally be from 27 to 125 millions of cells in the compass of a cubic inch!

405. Some parts are built up as a compact structure; in others cells are arranged so as to build up regular air-channels, as in the stems of aquatic and other water-loving plants (Fig. 440), or to leave irregular spaces, as in the lower part of most leaves, where the cells only here and there come into close contact (Fig. 443).



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406. All such soft cellular tissue, like this of leaves, that of pith, and of the green bark, is called Parenchyma, while fibrous and woody parts are composed of Prosenchyma, that is, of peculiarly transformed

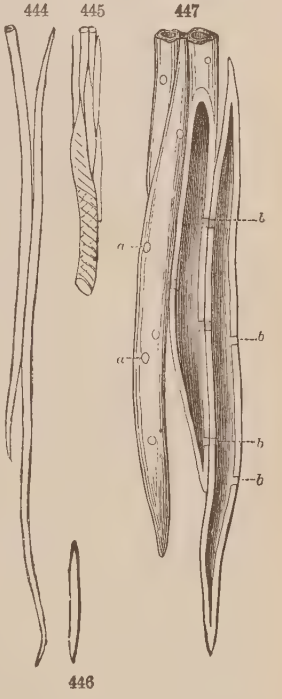
407. Strengthening Cells. Common cellular tissue, which makes up the whole structure of all very young plants, and the whole of Mosses and other vegetables of the lowest grade, even when full grown, is too tender or too brittle to give needful strength and toughness for plants which are to rise to any considerable height and support themselves. In these needful strength is imparted, and the conveyance of sap through the plant is facilitated, by the change, as they are formed, of some cells into thicker-walled and tougher tubes, and by the running together of some of

Fig. 441. Much magnified small portion of young root of a seedling Maple (such as of Fig. 82); and 442, a few cells of same more magnified. The prolongations from the back of some of the cells are root-hairs.

Fig. 443. Magnified section through the thickness of a leaf of Florida Star-Anise.

these, or the prolongation of others, into hollow fibres or tubes of various size. Two sorts of such transformed cells go together, and essentially form the

408. **Wood.** This is found in all common herbs, as well as in shrubs and trees, but the former have much less of it in proportion to the softer cellular tissue. It is formed very early in the growth of the root, stem, and leaves, — traces of it appearing in large embryos even while yet in the seed. Those cells that lengthen, and at the same time thicken their walls form the proper WOODY FIBRE or WOOD-CELLS; those of larger size and thinner walls, which are thickened only in certain parts so as to have peculiar markings, and which often are seen to be made up of a row of cylindrical cells, with the partitions between absorbed or broken away, are called DUCTS, or sometimes VESSELS. There are all gradations between wood-cells and ducts, and between both these and common cells. But in most plants the three kinds are fairly distinct.



409. The proper cellular tissue, or *parenchyma*, is the ground-work of root, stem, and leaves; this is traversed, chiefly lengthwise, by the strengthening and conducting tissue, wood-cells and duct-cells, in the form of bundles or threads, which, in the stems and stalks of herbs are fewer and comparatively scattered, but in shrubs and trees so numerous and crowded that in the stems and all permanent parts they make a solid mass of wood. They extend into and ramify in the leaves, spreading out in a horizontal plane, as the framework of ribs and veins, which supports the softer cellular portion or parenchyma.

410. **Wood-Cells, or Woody Fibres,** consist of tubes, commonly between one and two thousandths, but in Pine-wood sometimes two or three hundredths of an inch in diameter. Those from the tough bark of the Basswood

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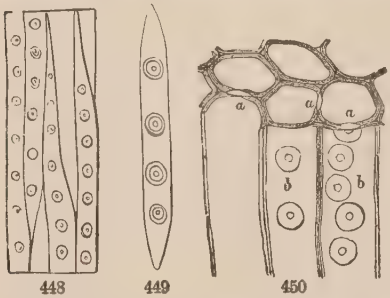
FIG. 444. Magnified wood-cells of the bark (bast-cells) of Basswood, one and part of another. 445. Some wood-cells from the wood (and below part of a duct); and 446, a detached wood-cell of the same; equally magnified.

FIG. 447. Some wood-cells from Buttonwood, Platanus, highly magnified, a whole cell and lower end of another on the left; a cell cut half away lengthwise, and half of another on the right; some pores or pits (*a*) seen on the left; while *b b* mark sections through these on the cut surface. When living and young the protoplasm extends into these and by minuter perforations connects across them In age the pits become open passages, facilitating the passage of sap and air

shown in Fig. 444, are only the fifteen-hundredth of an inch wide. Those of Buttonwood (Fig. 447) are larger, and are here highly magnified besides. The figures show the way wood-cells are commonly put together, namely, with their tapering ends overlapping each other, — spliced together, as it were, — thus giving more strength and toughness. In hard woods, such as Hickory and Oak, the walls of these tubes are very thick, as well as dense; while in soft woods, such as White-Pine and Basswood, they are thinner.

411. Wood-cells in the bark are generally longer, finer, and tougher than those of the proper wood, and appear more like fibres. For example, Fig. 446 represents a cell of the wood of Basswood of average length, and Fig. 444 one (and part of another) of the fibrous bark, both drawn to the same scale. As these long cells form the principal part of fibrous bark, or *bast*, they are named *Bast-cells* or *Bast-fibres*. These give the great toughness and flexibility to the inner bark of Basswood (i. e. Bast-wood) and of Leatherwood; and they furnish the invaluable fibres of flax and hemp; the proper wood of their stems being tender, brittle, and destroyed by the processes which separate for use the tough and slender bast-cells. In Leatherwood (Dirca) the bast-cells are remarkably slender. A view of one, if magnified on the scale of Fig. 444, would be a foot and a half long.



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412. The wood-cells of Pines, and more or less of all other Coniferous trees, have on two of their sides very peculiar disk-shaped markings (Fig. 448–450) by which that kind of wood is recognizable.

413. **Ducts**, also called **Vessels**, are mostly larger than wood-cells: indeed, some of them, as in Red Oak, have calibre large enough to be discerned on a cross section by the naked eye. They make the visible porosity of such kinds of wood. This is particularly the case with *Dotted* ducts (Fig. 451, 452), the surface of which appears as if riddled with round or oval pores. Such ducts are commonly made up of a row of large cells more or less confluent into a tube.

Scalariform ducts (Fig. 458, 459), common in Ferns, and generally angled by mutual pressure in the bundles,

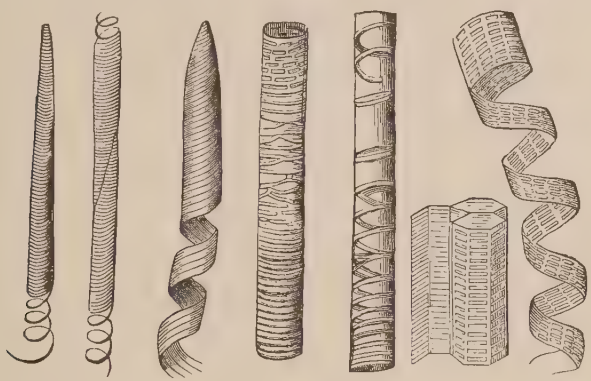
451 452

Fig. 448. Magnified bit of a pine-shaving, taken parallel with the silver grain. 449. Separate whole wood-cell, more magnified. 450. Same, still more magnified, both sections represented: *a*, disks in section, *b*, in face.

Fig. 451, 452. A large and a smaller dotted duct from Grape-Vine.

have transversely elongated thin places, parallel with each other, giving a ladder-like appearance, whence the name.

Annular ducts (Fig. 457) are marked with cross lines or rings, which are thickened portions of the cell-wall.



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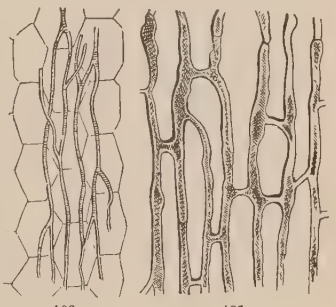
Spiral ducts or vessels (Fig. 453–455) have thin walls, strengthened by a spiral fibre adherent within. This is as delicate and as strong as spider-web: when uncoiled by pulling apart, it tears up and annihilates the cell-wall. The uncoiled threads are seen by gently pulling apart many leaves, such as those of Amaryllis, or the stalk of a Strawberry leaflet.



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Laticiferous ducts, Vessels of the Latex, or Milk-vessels are peculiar branching tubes which hold *latex* or milky juice in certain plants. It is very difficult to see them, and more so to make out their nature. They are peculiar in branching and inosculating, so as to make a net-work of tubes, running in among the cellular tissue; and they are very small, except when gorged and old (Fig. 460, 461).

Fig. 453, 454. Spiral ducts which uncoil into a single thread. 455. Spiral duct which tears up as a band. 456. An annular duct, with variations above. 457. Loose spiral duct passing into annular. 458. Scalariform ducts of a Fern; part of a bundle, prismatic by pressure. 459. One torn into a band.

Fig. 460. Milk Vessels of Dandelion, with cells of the common cellular tissue. 461 Others from the same older and gorged with milky juice. All highly magnified.

§ 2. CELL-CONTENTS.

414. The living contents of young and active cells are mainly protoplasm with water or watery sap which this has imbibed. Old and effete cells are often empty of solid matter, containing only water with whatever may be dissolved in it, or air, according to the time and circumstances. All the various products which plants in general elaborate, or which particular plants specially elaborate, out of the common food which they derive from the soil and the air, are contained in the cells, and in the cells they are produced.

415. Sap is a general name for the principal liquid contents, —*Crude sap*, for that which the plant takes in, *Elaborated sap* for what it has digested or assimilated. They must be undistinguishably mixed in the cells.

416. Among the solid matters into which cells convert some of their elaborated sap two are general and most important. These are *Chlorophyll* and *Starch*.

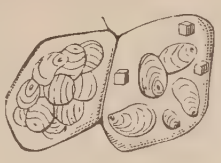
417. Chlorophyll (meaning *leaf-green*) is what gives the green color to herbage. It consists of soft grains of rather complex nature, partly wax-like, partly protoplasmic. These abound in the cells of all common leaves and the green rind of plants, wherever exposed to the light. The green color is seen through the transparent skin of the leaf and the walls of the containing cells. Chlorophyll is essential to ordinary assimilation in plants: by its means, under the influence of sunlight, the plant converts crude sap into vegetable matter.

418. Far the largest part of all vegetable matter produced is that which goes to build up the plant's fabric or cellular structure, either directly or indirectly. There is no one good name for this most important product of vegetation. In its final state of cell-walls, the permanent fabric of herb and shrub and tree, it is called *Cellulose* (408): in its most soluble form it is *Sugar* of one or another kind; in a less soluble form it is *Dextrine*, a kind of liquefied starch: in the form of solid grains stored up in the cells it is *Starch*. By a series of slight chemical changes (mainly a variation in the water entering into the composition), one of these forms is converted into another.

419. Starch (*Farina* or *Fecula*) is the form in which this common plant material is, as it were, laid by for future use. It consists of solid grains, somewhat different in form in different plants, in size varying from $\frac{1}{300}$ to $\frac{1}{4000}$ of an inch, partly translucent when wet, and of a pearly lustre. From the concentric lines, which commonly appear under the microscope, the grains seem to be made up of layer over layer. When loose they are commonly oval, as in potato-starch (Fig. 462): when much compacted the grains may become angular (Fig. 463).

420. The starch in a potato was produced in the foliage. In the soluble form of dextrine, or that of sugar, it was conveyed through the cells of the herbage and stalks to a subterranean shoot, and there stored up in the

tuber. When the potato sprouts, the starch in the vicinity of developing buds or eyes is changed back again, first into mucilaginous dextrine, then into sugar, dissolved in the sap, and in this form it is made to flow to the growing parts, where it is laid down into cellulose or cell-wall.



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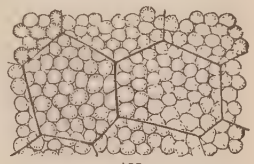

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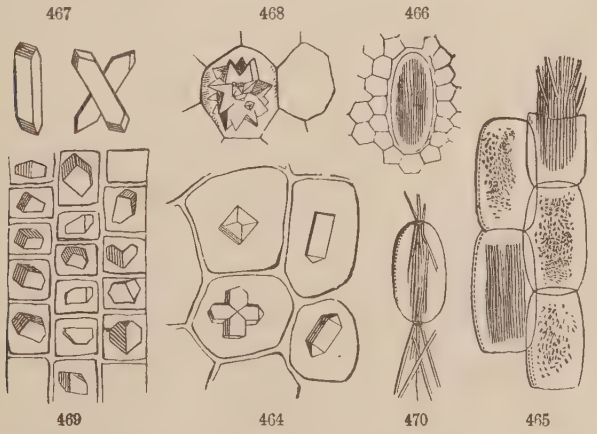
421. Besides these cell-contents which are in obvious and essential relation to nutrition, there are others the use of which is problematical. Of such the commonest are

422. **Crystals.** These when slender or needle-shaped are called Rhaphides. They are of inorganic matter, usually of oxalate or phosphate or sulphate of lime. Some, at least of the latter, may be direct crystalliza-



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tions of what is taken in dissolved in the water absorbed, but others must be the result of some elaboration in the plant. Some plants have hardly any; others abound in them, especially in the foliage and bark. In Locust-bark almost every cell holds a crystal; so that in a square inch not thicker than writing-paper there may be over a million and a half of them. When

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Fig. 462. Some magnified starch-grains, in two cells of a potato. 463. Some cells of the albumen or floury part of Indian Corn, filled with starch-grains.

Fig. 464. Four cells from dried Onion-peel, each holding a crystal of different shape, one of them twinned. 465. Some cells from stalk of Rhubarb-plant, three containing chlorophyll; two (one torn across) with rhaphides. 466. Rhaphides in a cell, from Arisæma, with small cells surrounding. 467. Prismatic crystals from the bark of Hickory. 468. Glomerate crystal in a cell, from Beet-root. 469. A few cells of Locust-bark, a crystal in each. 470. A detached cell, with rhaphides being forced out, as happens when put in water.

needle-shaped (rhaphides), as in stalks of Calla-Lily, Rhubarb, or Four o'clock, they are usually packed in sheaf-like bundles. (Fig. 465, 466.)

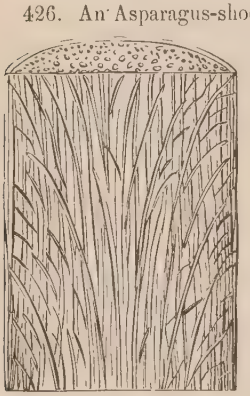
§ 3. ANATOMY OF ROOTS AND STEMS.

423. This is so nearly the same that an account of the internal structure of stems may serve for the root also.

424. At the beginning, either in the embryo or in an incipient shoot from a bud, the whole stem is of tender cellular tissue or parenchyma. But wood (consisting of wood-cells and ducts or vessels) begins to be formed in the earliest growth; and is from the first arranged in two ways, making two general kinds of wood. The difference is obvious even in herbs, but is more conspicuous in the enduring stems of shrubs and trees.

425. On one or the other of these two types the stems of all phanerogamous plants are constructed. In one, the wood is made up of separate threads, scattered here and there throughout the whole diameter of the stem. In the other, the wood is all collected to form a layer (in a slice across the stem appearing as a ring) between a central cellular part which has none in it, the *Pith*, and an outer cellular part, the *Bark*.

426. An Asparagus-shoot and a Corn-stalk for herbs, and a rattan for a woody kind, represent the first kind. To it belong all plants with monocotyledonous embryo (40). A Bean-stalk and the stem of any common shrub or tree represent the second; and



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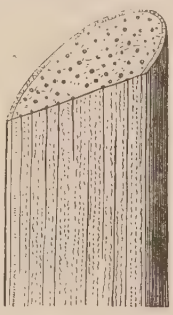

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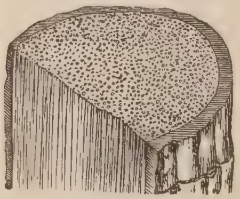

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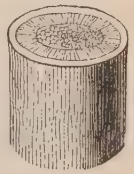
to it belong all plants with dicotyledonous or polycotyledonous embryo. The first has been called, not very properly, *Endogenous*, which means inside-growing; the second, properly enough, *Exogenous*, or outside-growing.

427. Endogenous Stems, those of Monocotyls (40), attain their greatest size and most characteristic development in Palms and Dragon-trees, therefore chiefly in warm climates, although the Palmetto and some

FIG. 471. Diagram of structure of Palm or Yucca. 472. Structure of a Corn-stalk, in transverse and longitudinal section. 473. Same of a small Palm-stem. The dots on the cross sections represent cut ends of the woody bundles or threads.

Yuccas become trees along the southern borders of the United States. In such stems the woody bundles are more numerous and crowded toward the circumference, and so the harder wood is outside; while in an exogenous stem the oldest and hardest wood is toward the centre. An endogenous stem has no clear distinction of pith, bark, and wood, concentrically arranged, no silver grain, no annual layers, no bark that peels off clean from the wood. Yet old stems of Yuccas and the like, that continue to increase in diameter, do form a sort of layers and a kind of scaly bark when old. Yuccas show well the curving of the woody bundles (Fig. 471) which below taper out and are lost at the rind.

428. **Exogenous Stems**, those of Dicotyls (37), or of plants coming from dicotyledonous and also polycotyledonous embryos, have a structure which is familiar in the wood of our ordinary trees and shrubs. It is the same in an herbaceous shoot (such as a Flax-stem, Fig. 474) as in a Maple-stem of the first year's growth, except that the woody layer is commonly thinner or perhaps reduced to a circle of bundles. It was so in the tree-stem at the beginning. The wood all forms in a cylinder, — in cross section a ring — around a central cellular part, dividing the cellular core within, the pith, from a cellular bark without. As the wood-bundles increase in number and in size,



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they press upon each other and become wedge-shaped in the cross section; and they continue to grow from the outside, next the bark, so that they become very thin wedges or plates. Between the plates or wedges are very thin plates (in cross section lines) of much compressed cellular tissue, which connect the pith with the bark. The plan of a one-year-old woody stem of this kind is exhibited in the figures, which are essentially diagrams.

429. When such a stem grows on from year to year, it adds annually a

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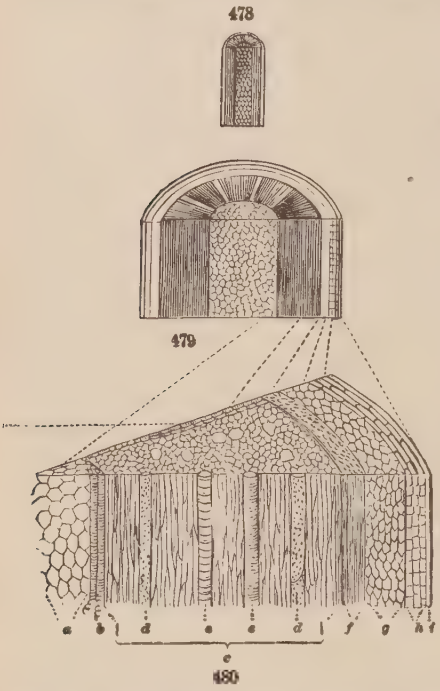
FIG. 474. Short piece of stem of Flax, magnified, showing the bark, wood, and pith in a cross section.

FIG. 475. Diagram of a cross section of a very young exogenous stem, showing six woody bundles or wedges. 476. Same later, with wedges increased to twelve. 477. Still later, the wedges filling the space, separated only by the thin lines, or medullary rays, running from pith to bark.

layer of wood outside the preceding one, between that and the bark. This is exogenous growth, or outside-growing, as the name denotes.

430. Some new bark is formed every year, as well as new wood, the former inside, as the latter is outside of that of the year preceding. The ring or zone of tender forming tissue between the bark and the wood has been called the *Cambium Layer*. *Cambium* is an old name of the physiologists for nutritive juice. And this thin layer is so gorged with rich nutritive sap when spring growth is renewed, that the bark then seems to be loose from the wood and a layer of viscid sap (or *cambium*) to be poured out between the two. But there is all the while a connection of the bark and the wood by delicate cells, rapidly multiplying and growing.



431. **The Bark** of a year-old stem consists of three parts, more or less distinct, namely, — beginning next the wood, —

1. The Liber or Fibrous Bark, the *Inner Bark*. This contains some wood-cells, or their equivalent, commonly in the form of bast or bast-cells (411, Fig. 444), such as those of Basswood or Linden, and among herbs those of flax and hemp, which are spun and woven or made into cordage. It also contains cells which are named *sieve*-cells, on account of numerous slits and pores in their walls, by which the protoplasm of contiguous cells communicates. In woody stems, whenever a new layer of wood is formed, some new liber or inner bark is also formed outside of it.

Fig. 478. Piece of a stem of Soft Maple, of a year old, cut crosswise and lengthwise.

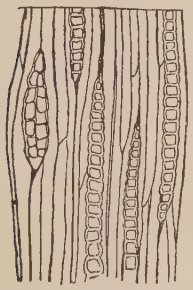
Fig. 479. A portion of the same, magnified.

Fig. 480. A small piece of the same, taken from one side, reaching from the bark to the pith, and highly magnified: *a*, a small bit of the pith; *b*, spiral ducts of what is called the *medullary sheath*; *c*, the wood; *d*, *d*, dotted ducts in the wood; *e*, *e*, annular ducts; *f*, the liber or inner bark; *g*, the green bark; *h*, the corky layer; *i*, the skin, or epidermis; *j*, one of the medullary rays, or plates of silver grain, seen on the cross-section.

2. The Green Bark or *Middle Bark*. This consists of cellular tissue only, and contains the same green matter (*chlorophyll*, 417) as the leaves. In woody stems, before the season's growth is completed, it becomes covered by

3. The Corky Layer or *Outer Bark*, the cells of which contain no chlorophyll, and are of the nature of *cork*. Common cork is the thick corky layer of the bark of the Cork-Oak of Spain. It is this which gives to the stems or twigs of shrubs and trees the aspect and the color peculiar to each, — light gray in the Ash, purple in the Red Maple, red in several Dogwoods, etc.

4. The Epidermis, or skin of the plant, consisting of a layer of thick-sided empty cells, which may be considered to be the outermost layer, or in most herbaceous stems the only layer, of cork-cells.



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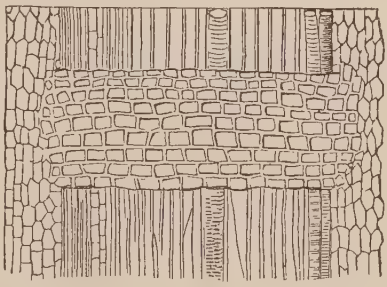

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432. The green layer of bark seldom grows much after the first season. Sometimes the corky layer grows and forms new layers, inside of the old, for years, as in the Cork-Oak, the Sweet Gum-tree, and the White and the Paper Birch. But it all dies after a while; and the continual enlargement of the wood within finally stretches it more than it can bear, and sooner or later cracks and rends it, while the weather acts powerfully upon its surface; so the older bark perishes and falls away piecemeal year by year.

433. So on old trunks only the inner bark remains. This is renewed every year from within and so kept alive, while the older and outer layers die, are fissured and rent by the distending trunk, weathered and worn, and thrown off in fragments, — in some trees slowly, so that the bark of old trunks may acquire great thickness; in others, more rapidly. In Honeysuckles and Grape-Vines, the layers of liber loosen and die when only a year or two old. The annual layers of liber are sometimes as distinct as those of the wood, but often not so.

Fig. 481. Magnified view of surface of a bit of young Maple wood from which the bark has been torn away, showing the wood-cells and the bark-ends of medullary rays.

Fig. 482. Section in the opposite direction, from bark (on the left) to beginning of pith (on the right), and a medullary ray extending from one to the other.

434. **The Wood** of an exogenous trunk, having the old growths covered by the new, remains nearly unchanged in age, except from decay. Wherever there is an annual suspension and renewal of growth, as in temperate climates, the annual growths are more or less distinctly marked, in the form of concentric rings on the cross section, so that the age of the tree may be known by counting them. Over twelve hundred layers have been counted on the stumps of Sequoias in California, and it is probable that some trees now living antedate the Christian era.

435. The reason why the annual growths are distinguishable is, that the wood formed at the beginning of the season is more or less different in the size or character of the cells from that of the close. In Oak, Chestnut, etc., the first wood of the season abounds in dotted ducts, the calibre of which is many times greater than that of the proper wood-cells.

436. **Sap-wood, or Alburnum.** This is the newer wood, living or recently alive, and taking part in the conveyance of sap. Sooner or later, each layer, as it becomes more and more deeply covered by the newer ones and farther from the region of growth, is converted into

437. **Heart-wood, or Duramen.** This is drier, harder, more solid, and much more durable as timber, than sap-wood. It is generally of a different color, and it exhibits in different species the hue peculiar to each, such as reddish in Red-Cedar, brown in Black-Walnut, black in Ebony, etc. The change of sap-wood into heart-wood results from the thickening of the walls of the wood-cells by the deposition of hard matter, lining the tubes and diminishing their calibre; and by the deposition of a vegetable coloring-matter peculiar to each species. The heart-wood, being no longer a living part, may decay, and often does so, without the least injury to the tree, except by diminishing the strength of the trunk, and so rendering it more liable to be overthrown.

438. **The Living Parts of a Tree,** of the exogenous kind, are only these: first, the rootlets at one extremity; second, the buds and leaves of the season at the other; and third, a zone consisting of the newest wood and the newest bark, connecting the rootlets with the buds or leaves, however widely separated these may be, — in the tallest trees from two to four hundred feet apart. And these parts of the tree are all renewed every year. No wonder, therefore, that trees may live so long, since they annually reproduce everything that is essential to their life and growth, and since only a very small part of their bulk is alive at once. The tree survives, but nothing now living has been so long. In it, as elsewhere, life is a transitory thing, ever abandoning the *old*, and renewed in the *young*.

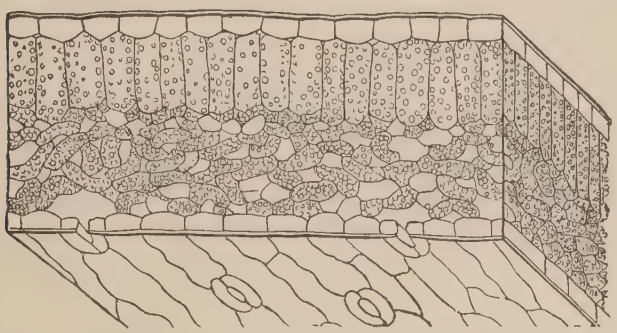
§ 4. ANATOMY OF LEAVES.

439. **The wood** in leaves is the framework of ribs, veins, and veinlets (125), serving not only to strengthen them, but also to bring in the sap, and to distribute it throughout every part. The cellular portion is the

green pulp, and is nearly the same as the green layer of the bark. So that the leaf may properly enough be regarded as a sort of expansion of the fibrous and green layers of the bark. It has no proper corky layer; but the whole is covered by a transparent skin or *epidermis*, resembling that of the stem.

440. The cells of the leaf are of various forms, rarely so compact as to form a close cellular tissue, usually loosely arranged, at least in the lower part, so as to give copious intervening spaces or air passages, communicating throughout the whole interior (Fig. 443, 483). The green color is given by the chlorophyll (417), seen through the very transparent walls of the cells and through the translucent epidermis of the leaf.

441. In ordinary leaves, having an upper and under surface, the green cells form two distinct strata, of different arrangement. Those of the upper stratum are oblong or cylindrical, and stand endwise to the surface of the leaf, usually close together, leaving hardly any vacant spaces; those of the lower are commonly irregular in shape, most of them with their longer diameter parallel to the face of the leaf, and are very loosely arranged, leaving many and wide air-chambers. The green color of the lower is therefore diluted, and paler than that of the upper face of the leaf. The upper part of the leaf is so constructed as to bear the direct action



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of the sunshine; the lower so as to afford freer circulation of air, and to facilitate transpiration. It communicates more directly than the upper with the external air by means of *Stomates*.

442. The Epidermis or skin of leaves and all young shoots is best seen in the foliage. It may readily be stripped off from the surface of a Lily-leaf, and still more so from more fleshy and soft leaves, such as those

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FIG. 483. Magnified section of a leaf of White Lily, to exhibit the cellular structure, both of upper and lower stratum, the air-passages of the lower, and the epidermis or skin, in section, also a little of that of the lower face, with some of its stomates.

of Houseleek. The epidermis is usually composed of a single layer, occasionally of two or three layers, of empty cells, mostly of irregular outline. The sinuous lines which traverse it, and may be discerned under low powers of the microscope (Fig. 487), are the boundaries of the epidermal cells.

484 485 486 487

443. Breathing-pores, or Stomates, Stomata (singular, a *Stoma*, — literally, a mouth) are openings through the epidermis into the air-chambers or intercellular passages, always between and guarded by a pair of thin-walled guardian cells. Although most abundant in leaves, especially on their lower face (that which is screened from direct sunlight), they are found on most other green parts. They establish a direct communication between the external air and that in the loose interior of the leaf. Their guardian cells or lips, which are soft and delicate, like those of the green pulp within, by their greater or less turgidity open or close the orifice as the moisture or dryness varies.

444. In the White Lily the stomata are so remarkably large that they may be seen by a simple microscope of moderate power, and may be discerned even by a good hand lens. There are about 60,000 of them to the square inch of the epidermis of the lower face of this Lily-leaf, and only about 3000 to the same space on the upper face. It is computed that an average leaf of an Apple-tree has on its lower face about 100,000 of these mouths.

§ 5. PLANT FOOD AND ASSIMILATION.

445. Only plants are capable of originating organizable matter, or the materials which compose the structure of vegetables and animals. The essential and peculiar work of plants is to take up portions of earth and air (water belonging to both) upon which animals cannot live at all, and to convert them into something organizable; that is, into something that, under life, may be built up into vegetable and animal structures. All the food of animals is produced by plants. Animals live upon vegetables,

FIG. 484. Small portion of epidermis of the lower face of a White-Lily leaf, with stomata.

FIG. 485. One of these, more magnified, in the closed state. 486. Another stoma, open.

FIG. 487. Small portion of epidermis of the Garden Balsam, highly magnified, showing very sinuous-walled cells, and three stomata.

directly or at second hand, the carnivorous upon the herbivorous; and vegetables live upon earth and air, immediately or at second hand.

446. **The Food of plants**, then, primarily, is earth and air. This is evident enough from the way in which they live. Many plants will flourish in pure sand or powdered chalk, or on the bare face of a rock or wall, watered merely with rain. And almost any plant may be made to grow from the seed in moist sand, and increase its weight many times, even if it will not come to perfection. Many naturally live suspended from the branches of trees high in the air, and nourished by it alone, never having any connection with the soil; and some which naturally grow on the ground, like the Live-forever of the gardens, when pulled up by the roots and hung in the air will often flourish the whole summer long.

447. It is true that fast-growing plants, or those which produce much vegetable matter in one season (especially in such concentrated form as to be useful as food for man or the higher animals) will come to maturity only in an enriched soil. But what is a rich soil? One which contains decomposing vegetable matter, or some decomposing animal matter; that is, in either case, some decomposing organic matter formerly produced by plants. Aided by this, grain-bearing and other important vegetables will grow more rapidly and vigorously, and make a greater amount of nourishing matter, than they could if left to do the whole work at once from the beginning. So that in these cases also all the organic or organizable matter was made by plants, and made out of earth and air. Far the larger and most essential part was air and water.

448. Two kinds of material are taken in and used by plants; of which the first, although more or less essential to perfect plant-growth, are in a certain sense subsidiary, if not accidental, viz.: —

Earthy constituents, those which are left in the form of ashes when a leaf or a stick of wood is burned in the open air. These consist of some *potash* (or *soda* in a marine plant), some *silex* (the same as flint), and a little *lime*, *alumine*, or *magnesia*, *iron* or *manganese*, *sulphur*, *phosphorus*, etc., — some or all of these in variable and usually minute proportions. They are such materials as happen to be dissolved, in small quantity, in the water taken up by the roots; and when that is consumed by the plant, or flies off pure (as it largely does) by exhalation, the earthy matter is left behind in the cells, — just as it is left incrusting the sides of a teakettle in which much hard water has been boiled. Naturally, therefore, there is more earthy matter (i. e. more ashes) in the leaves than in any other part (sometimes as much as seven per cent, when the wood contains only two per cent); because it is through the leaves that most of the water escapes from the plant. Some of this earthy matter incrusts the cell-walls, some goes to form crystals or rhaphides, which abound in many plants (422), some enters into certain special vegetable products, and some appears to be necessary to the well-being of the higher orders of plants, although forming no necessary part of the proper vegetable structure.

The essential constituents of the organic fabric are those which are dissipated into air and vapor in complete burning. They make up from 88 to 99 per cent of the leaf or stem, and essentially the whole both of the cellulose of the walls and the protoplasm of the contents. Burning gives these materials of the plant's structure back to the air, mainly in the same condition in which the plant took them, the same condition which is reached more slowly in natural decay. The chemical elements of the cell-walls (or cellulose, 402), as also of starch, sugar, and all that class of organizable cell-material, are carbon, hydrogen, and oxygen (399). The same, with nitrogen, are the constituents of protoplasm, or the truly vital part of vegetation.

449. These chemical elements out of which organic matters are composed are supplied to the plant by water, carbonic acid, and some combinations of nitrogen.

Water, far more largely than anything else, is imbibed by the roots; also more or less by the foliage in the form of vapor. Water consists of oxygen and hydrogen; and cellulose or plant-wall, starch, sugar, etc., however different in their qualities, agree in containing these two elements in the same relative proportions as in water.

Carbonic acid gas (Carbon dioxide) is one of the components of the atmosphere, — a small one, ordinarily only about $\frac{1}{2500}$ of its bulk, — sufficient for the supply of vegetation, but not enough to be injurious to animals, as it would be if accumulated. Every current or breeze of air brings to the leaves expanded in it a succession of fresh atoms of carbonic acid, which it absorbs through its multitudinous breathing-pores. This gas is also taken up by water. So it is brought to the ground by rain, and is absorbed by the roots of plants, either as dissolved in the water they imbibe, or in the form of gas in the interstices of the soil. Manured ground, that is, soil containing decomposing vegetable or animal matters, is constantly giving out this gas into the interstices of the soil, whence the roots of the growing crop absorb it. Carbonic acid thus supplied, primarily from the air, is the source of the carbon which forms much the largest part of the substance of every plant. The proportion of carbon may be roughly estimated by charring some wood or foliage; that is, by heating it out of contact with the air, so as to decompose and drive off all the other constituents of the fabric, leaving the large bulk of charcoal or carbon behind.

Nitrogen, the remaining plant-element, is a gas which makes up more than two thirds of the atmosphere, is brought into the foliage and also to the roots (being moderately soluble in water) in the same ways as is carbonic acid. The nitrogen which, mixed with oxygen, a little carbonic acid, and vapor of water, constitutes the air we breathe, is the source of this fourth plant-element. But it is very doubtful if ordinary plants can use any nitrogen gas directly as food; that is, if they can directly cause it to combine with the other elements so as to form protoplasm. But when combined with hydrogen (forming ammonia), or when combined with oxygen

(nitric acid and nitrates) plants appropriate it with avidity. And several natural processes are going on in which nitrogen of the air is so combined and supplied to the soil in forms directly available to the plant. The most efficient is *nitrification*, the formation of nitre (nitrate of potash) in the soil, especially in all fertile soils, through the action of a bacterial ferment.

450. Assimilation in plants is the conversion of these inorganic substances — essentially, water, carbonic acid, and some form of combined or combinable nitrogen — into vegetable matter. This most dilute food the living plant concentrates and assimilates to itself. Only plants are capable of converting these mineral into organizable matters; and this all-important work is done by them (so far as all ordinary vegetation is concerned) only

451. *Under the light of the sun, acting upon green parts or foliage*, that is, upon the chlorophyll, or upon what answers to chlorophyll, which these parts contain. The sun in some way supplies a power which enables the living plant to originate these peculiar chemical combinations, — to organize matter into forms which are alone capable of being endowed with life. The proof of this proposition is simple; and it shows at the same time, in the simplest way, what a plant does with the water and carbonic acid it consumes. Namely, 1st, it is only in sunshine or bright daylight that the green parts of plants give out oxygen gas, — then they regularly do so; and 2d, the giving out of this oxygen gas is required to render the chemical composition of water and carbonic acid the same as that of *cellulose*, that is, of the plant's permanent fabric. This shows why plants spread out so large a surface of foliage. Leaves are so many workshops, full of machinery worked by sun-power. The emission of oxygen gas from any sun-lit foliage is seen by placing some of this under water, or by using an aquatic plant, by collecting the air bubbles which rise, and by noting that a taper burns brighter in this air. Or a leafy plant in a glass globe may be supplied with a certain small percentage of carbonic acid gas, and after proper exposure to sunshine, the air on being tested will be found to contain less carbonic acid and just so much the more oxygen gas.

452. Now if the plant is making cellulose or any equivalent substance, — that is, is making the very materials of its fabric and growth, as must generally be the case, — all this oxygen gas given off by the leaves comes from the decomposition of carbonic acid taken in by the plant. For cellulose, and also starch, dextrine, sugar, and the like are composed of carbon along with oxygen and hydrogen in just the proportions to form water. And the carbonic acid and water taken in, less the oxygen which the carbon brought with it as carbonic acid, and which is given off from the foliage in sunshine, just represents the manufactured article, cellulose.

453. It comes to the same if the first product of assimilation is sugar, or dextrine which is a sort of soluble starch, or starch itself. And in the plant all these forms are readily changed into one another. In the tiny seedling, as fast as this assimilated matter is formed it is used in growth, that is, in the formation of cell-walls. After a time some or much of

the product may be accumulated in store for future growth, as in the root of the turnip, or the tuber of the potato, or the seed of corn or pulse. This store is mainly in the form of starch. When growth begins anew, this starch is turned into dextrine or into sugar, in liquid form, and used to nourish and build up the germinating embryo or the new shoot, where it is at length converted into cellulose and used to build up plant-structure.

454. But that which builds plant-fabric is not the cellular structure itself; the work is done by the living protoplasm which dwells within the walls. This also has to take and to assimilate its proper food, for its own maintenance and growth. Protoplasm assimilates, along with the other three elements, the nitrogen of the plant's food. This comes primarily from the vast stock in the atmosphere, but mainly through the earth, where it is accumulated through various processes in a fertile soil, — mainly, so far as concerns crops, from the decomposition of former vegetables and animals. This protoplasm, which is formed at the same time as the simpler cellulose, is essentially the same as the flesh of animals, and the source of it. It is the common basis of vegetable and of animal life.

455. *So plant-assimilation produces all the food and fabric of animals.* Starch, sugar, the oils (which are, as it were, these farinaceous matters more deoxidated), chlorophyll, and the like, and even cellulose itself, form the food of herbivorous animals and much of the food of man. When digested they enter into the blood, undergo various transformations, and are at length decomposed into carbonic acid and water, and exhaled from the lungs in respiration, — in other words, are given back to the air by the animal as the very same materials which the plant took from the air as its food, — are given back to the air in the same form that they would have taken if the vegetable matter had been left to decay where it grew, or if it had been set on fire and burned; and with the same result, too, as to the heat, — the heat in this case producing and maintaining the proper temperature of the animal.

456. The protoplasm and other products containing nitrogen (gluten, legumine, etc.), and which are most accumulated in grains and seeds (for the nourishment of their embryos when they germinate), compose the most nutritious vegetable food consumed by animals; they form their proper flesh and sinews, while the earthy constituents of the plant form the earthy matter of the bones, etc. At length decomposed, in the secretions and excretions, these nitrogenous constituents are through successive changes finally resolved into mineral matter, into carbonic acid, water, and ammonia or some nitrates, — into exactly or essentially the same materials which the plants took up and assimilated. Animals depend upon vegetables absolutely and directly for their subsistence; also indirectly, because

457. *Plants purify the air for animals.* In the very process by which they create food they take from the air carbonic acid gas, injurious to animal respiration, which is continually poured into it by the breathing of all animals, by all decay, by the burning of fuel and all other ordinary combustion; and

they restore an equal bulk of life-sustaining oxygen needful for the respiration of animals, — needful, also, in a certain measure, for plants in any work they do. For in plants, as well as in animals, work is done at a certain cost.

§ 6. PLANT WORK AND MOVEMENT.

458. As the organic basis and truly living material of plants is identical with that of animals, so is the life at bottom essentially the same; but in animals something is added at every rise from the lowest to highest organisms. Action and work in living beings require movement.

459. Living things move; those not living are only moved. Plants move as truly as do animals. The latter, nourished as they are upon organized food, which has been prepared for them by plants, and is found only here and there, must needs have the power of going after it, of collecting it, or at least of taking it in; which requires them to make spontaneous movements. But ordinary plants, with their wide-spread surface, always in contact with the earth and air on which they feed, — the latter everywhere the same, and the former very much so, — might be thought to have no need of movement. Ordinary plants, indeed, have no locomotion; some float, but most are rooted to the spot where they grew. Yet probably all of them execute various movements which must be as truly self-caused as are those of the lower grades of animals, — movements which are overlooked only because too slow to be directly observed. Nevertheless, the motion of the hour-hand and of the minute-hand of a watch is not less real than that of the second-hand.

460. **Locomotion.** Moreover, many microscopic plants living in water are seen to move freely, if not briskly, under the microscope; and so likewise do more conspicuous aquatic plants in their embryo-like or seedling state. Even at maturity, species of Oscillaria (such as in Fig. 488, minute worm-shaped plants of fresh waters, taking this name from their oscillating motions) freely execute three different kinds of movement, the very delicate investing coat of cellulose not impeding the action of the living protoplasm within. Even when this coat is firmer and hardened with a siliceous deposit, such crescent-shaped or boat-shaped one-celled plants as *Closterium* or *Navicula* are able in some way to move along from place to place in the water.

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461. **Movements in Cells, or Cell-circulation,** sometimes called *Cyclosis*, has been detected in so many plants, especially in comparatively

Fig. 488. Two individuals of an Oscillaria, magnified.

transparent aquatic plants and in hairs on the surface of land plants (where it is easiest to observe), that it may be inferred to take place in all cells during the most active part of their life. This motion is commonly a streaming movement of threads of protoplasm, carrying along solid granules by which the action may be observed and the rate measured, or in some cases it is a rotation of the whole protoplasmic contents of the cell. A comparatively low magnifying power will show it in the cells of Nitella and Chara (which are cryptogamous plants); and under a moderate power it is well seen in the Tape Grass of fresh water, Vallisneria, and in Naias flexilis (Fig. 489). Minute particles and larger greenish globules are seen to be carried along, as if in a current, around the cell, passing up one side, across the end, down the other and across the bottom, completing the circuit sometimes within a minute or less when well warmed. To see it well in the cell, which like a string of beads form the hairs on the stamens of Spiderwort, a high magnifying power is needed.

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462. **Transference of Liquid from Cell to Cell, and** so from place to place in the plant, the absorption of water by the rootlets, and the exhalation of the greater part of it from the foliage, these and similar operations are governed by the physical laws which regulate the diffusion of fluids, but are controlled by the action of living protoplasm. Equally under vital control are the various chemical transformations which attend assimilation and growth, and which involve not only molecular movements but conveyance. Growth itself, which is the formation and shaping of new parts, implies the direction of internal activities to definite ends.

463. **Movements of Organs.** The living protoplasm, in all but the lowest grade of plants, is enclosed and to common appearance isolated in separate cells, the walls of which can only in their earliest state be said to be alive. Still plants are able to cause the protoplasm of adjacent cells to act in concert, and by their combined action to effect movements in roots, stems, or leaves, some of them very slow and gradual, some manifest and striking. Such movements are brought about through individually minute changes in the form or tension in the protoplasm of the innumerable cells which make up the structure of the organ. Some of the slower movements are effected during growth, and may be explained by inequality of growth on the two sides of the bending organ. But the more rapid changes of position, and some of the slow ones, cannot be so explained.

FIG. 489. A few cells of a leaf of Naias flexilis, highly magnified: the arrows indicate the courses of the circulating currents.

464. **Root-movements.** In its growth a root turns or bends away from the light and toward the centre of the earth, so that in lengthening it buries itself in the soil where it is to live and act. Every one must have observed this in the germination of seeds. Careful observations have shown that the tip of a growing root also makes little sweeps or short movements from side to side. By this means it more readily insinuates itself into yielding portions of the soil. The root-tips will also turn toward moisture, and so secure the most favorable positions in the soil.

465. **Stem-movements.** The root end of the caulicle or first joint of stem (that below the cotyledons) acts like the root, in turning downward in germination (making a complete bend to do so if it happens to point upward as the seed lies in the ground), while the other end turns or points skyward. These opposite positions are taken in complete darkness as readily as in the light, in dryness as much as in moisture: therefore, so far as these movements are physical, the two portions of the same internode appear to be oppositely affected by gravitation or other influences.

466. Rising into the air, the stem and green shoots generally, while young and pliable, bend or direct themselves toward the light, or toward the stronger light when unequally illuminated; while roots turn toward the darkness.

467. Many growing stems have also a movement of *Nutation*, that is, of nodding successively in different directions. This is brought about by a temporary increase of turgidity of the cells along one side, thus bowing the stem over to the opposite side; and this line of turgescence travels round the shoot continually, from right to left or from left to right according to the species: thus the shoot bends to all points of the compass in succession. Commonly this nutation is slight or hardly observable. It is most marked in

468. **Twining Stems** (Fig. 90). The growing upper end of such stems, as is familiar in the Hop, Pole Beans, and Morning-Glory, turns over in an inclined or horizontal direction, thus stretching out to reach a neighboring support, and by the continual change in the direction of the nodding, sweeps the whole circle, the sweeps being the longer as the stem lengthens. When it strikes against a support, such as a stem or branch of a neighboring plant, the motion is arrested at the contact, but continues at the growing apex beyond, and this apex is thus made to wind spirally around the supporting body.

469. **Leaf-movements** are all but universal. The presentation by most leaves of their upper surface to the light, from whatever direction that may come, is an instance; for when turned upside down they twist or bend round on the stalk to recover this normal position. Leaves, and the leaflets of compound leaves, change this position at nightfall, or when the light is withdrawn; they then take what is called their sleeping posture, resuming the diurnal position when daylight returns. This is very striking

in Locust-trees, in the Sensitive Plant (Fig. 490), and in Woodsorrel. Young seedlings droop or close their leaves at night in plants which are not thus affected in the adult foliage. All this is thought to be a protection against the cold by nocturnal radiation.

470. Various plants climb by a coiling movement of their leaves or their leaf-stalks. Familiar examples are seen in Clematis, Maurandia, Tropæolum, and in a Solanum which is much cultivated in greenhouses (Fig. 172). In the latter, and in other woody plants which climb in this way, the petioles thicken and harden after they have grasped their support, thus securing a very firm hold.

471. **Tendril movements.** Tendrils are either leaves or stems (98, 168), specially developed for climbing purposes. Cobæa is a good example of partial transformation; some of the leaflets are normal, some of the same leaf are little tendrils, and some intermediate in character. The Passion-flowers give good examples of simple stem-tendrils (Fig. 92); Grape-Vines, of branched ones. Most tendrils make revolving sweeps, like those of twining stems. Those of some Passion-flowers, in sultry weather, are apt to move fast enough for the movement actually to be seen for a part of the circuit, as plainly as that of the second-hand of a watch. Two herbaceous species, Passiflora gracilis and P. sicyoides (the first an annual, the second a strong-rooted perennial of the easiest cultivation), are admirable for illustration both of revolving movements and of sensitive coiling.

472. **Movements under Irritation.** The most familiar case is that of the Sensitive Plant (Fig. 490). The leaves suddenly take their nocturnal position when roughly touched or when shocked by a jar. The leaflets close in pairs, the four outspread partial petioles come closer together, and the common petiole is depressed. The seat of the movements is at the base of the leaf-stalk and stalklets. Schrankia, a near relative of the Sensitive Plant, acts in the same way, but is slower. These are not anomalous actions, but only extreme manifestations of a faculty more or less common in foliage. In Locust and Honey-Locusts for example, repeated jars will slowly produce similar effects.

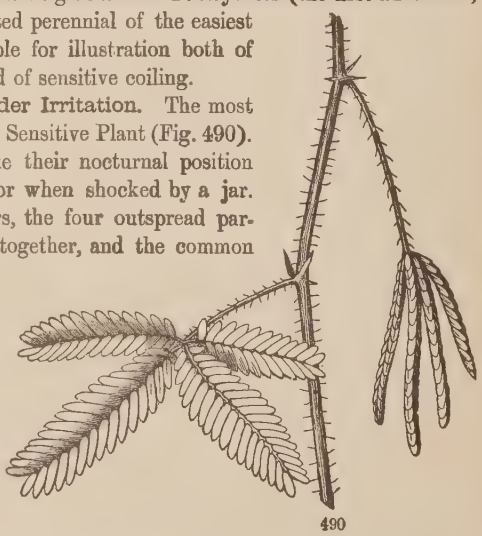

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FIG. 490. Piece of stem of Sensitive Plant (Mimosa pudica), with two leaves, the lower open, the upper in the closed state.

473. Leaf-stalks and tendrils are adapted to their uses in climbing by a similar sensitiveness. The coiling of the leaf-stalk is in response to a kind of irritation produced by contact with the supporting body. This may be shown by gentle rubbing or prolonged pressure upon the upper face of the leaf-stalk, which is soon followed by a curvature. Tendrils are still more sensitive to contact or light friction. This causes the free end of the tendril to coil round the support, and the sensitiveness, propagated downward along the tendril, causes that side of it to become less turgescent or the opposite side more so, thus throwing the tendril into coils. This shortening draws the plant up to the support. Tendrils which have not laid hold will at length commonly coil spontaneously, in a simple coil, from the free apex downward. In Sicyos, Echinocystis, and the above mentioned Passion-flowers (471), the tendril is so sensitive, under a high summer temperature, that it will curve and coil promptly after one or two light strokes by the hand.

474. Among spontaneous movements the most singular are those of Desmodium gyrans of India, sometimes called Telegraph-plant, which is cultivated on account of this action. Of its three leaflets, the larger (terminal) one moves only by drooping at nightfall and rising with the dawn. But its two small lateral leaflets, when in a congenial high temperature, by day and by night move upward and downward in a succession of jerks, stopping occasionally, as if to recover from exhaustion. In most plant-movements some obviously useful purpose is subserved: this of Desmodium gyrans is a riddle.

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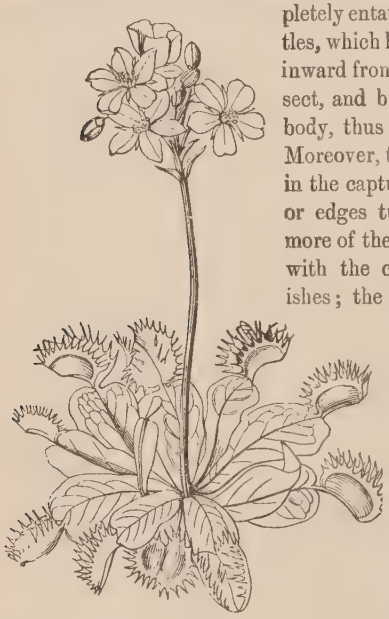
475. Movements in Flowers are very various. The most remarkable are in some way connected with fertilization (Sect. XIII.). Some occur under irritation: the stamens of Barberry start forward when touched at the base inside: those of many polyandrous flowers (of Sparmannia very strikingly) spread outwardly when lightly brushed: the two lips or lobes

FIG. 491. Portion of stem and leaves of Telegraph-plant (Desmodium gyrans), almost of natural size.

of the stigma in Mimulus close after a touch. Some are automatic and are connected with dichogamy (339): the style of Sabbatia and of large-flowered species of Epilobium bends over strongly to one side or turns downward when the blossom opens, but slowly erects itself a day or two later.

476. **Extraordinary Movements connected with Capture of Insects.** The most striking cases are those of Drosera and Dionæa; for an account of which see "How Plants Behave," and Goodale's "Physiological Botany."

477. The upper face of the leaves of the common species of Drosera, or Sundew, is beset with stout bristles, having a glandular tip. This tip secretes a drop of a clear but very viscid liquid, which glistens like a dew-drop in the sun; whence the popular name. When a fly or other small insect, attracted by the liquid, alights upon the leaf, the viscid drops are so tenacious that they hold it fast. In struggling it only becomes more completely entangled. Now the neighboring bristles, which have not been touched, slowly bend inward from all sides toward the captured insect, and bring their sticky apex against its body, thus increasing the number of bonds. Moreover, the blade of the leaf commonly aids in the capture by becoming concave, its sides or edges turning inward, which brings still more of the gland-tipped bristles into contact with the captive's body. The insect perishes; the clear liquid disappears, apparently by absorption into the tissue of the leaf. It is thought that the absorbed secretion takes with it some of the juices of the insect or the products of its decomposition.



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478. Dionæa muscipula, the most remarkable vegetable fly-trap (Fig. 176, 492), is related to the Sundews, and has a more special and active apparatus for fly-catching, formed of the summit of the leaf. The two halves of this rounded body move as if they were hinged upon the midrib; their edges are fringed with spiny but not glandular bristles, which interlock when the organ closes. Upon the face are two or three short and delicate bristles, which are sensitive. They do not themselves move when touched, but they propagate the sensitiveness to the organ itself, causing it to close with a quick movement. In a fresh

FIG. 492. Plant of Dionæa muscipula, or Venus's Fly-trap, reduced in size

and vigorous leaf, under a high summer temperature, and when the trap lies widely open, a touch of any one of the minute bristles on the face, by the finger or any extraneous body, springs the trap (so to say), and it closes suddenly; but after an hour or so it opens again. When a fly or other small insect alights on the trap, it closes in the same manner, and so quickly that the intercrossing marginal bristles obstruct the egress of the insect, unless it be a small one and not worth taking. Afterwards and more slowly it completely closes, and presses down upon the prey; then some hidden glands pour out a glairy liquid, which dissolves out the juices of the insect's body; next all is re-absorbed into the plant, and the trap opens to repeat the operation. But the same leaf perhaps never captures more than two or three insects. It ages instead, becomes more rigid and motionless, or decays away.

479. That some few plants should thus take animal food will appear less surprising when it is considered that hosts of plants of the lower grade, known as Fungi, moulds, rusts, ferments, Bacteria, etc., live upon animal or other organized matter, either decaying or living. That plants should execute movements in order to accomplish the ends of their existence is less surprising now when it is known that the living substance of plants and animals is essentially the same; that the beings of both kingdoms partake of a common life, to which, as they rise in the scale, other and higher endowments are successively superadded.

480. **Work uses up material and energy** in plants as well as in animals. The latter live and work by the consumption and decomposition of that which plants have assimilated into organizable matter through an energy derived from the sun, and which is, so to say, stored up in the assimilated products. In every internal action, as well as in every movement and exertion, some portion of this assimilated matter is transformed and of its stored energy expended. The steam-engine is an organism for converting the sun's radiant energy, stored up by plants in the fuel, into mechanical work. An animal is an engine fed by vegetable fuel in the same or other forms, from the same source, by the decomposition of which it also does mechanical work. The plant is the producer of food and accumulator of solar energy or force. But the plant, like the animal, is a consumer whenever and by so much as it does any work except its great work of assimilation. Every internal change and movement, every transformation, such as that of starch into sugar and of sugar into cell-walls, as well as every movement of parts which becomes externally visible, is done at the expense of a certain amount of its assimilated matter and of its stored energy; that is, by the decomposition or combustion of sugar or some such product into carbonic acid and water, which is given back to the air, just as in the animal it is given back to the air in respiration. So the respiration of plants is as real and as essential as that of animals. But what plants consume or decompose in their life and action is of insignificant amount in comparison with what they compose.

Section XVII. CRYPTOGAMOUS OR FLOWERLESS PLANTS.

481. Even the beginner in botany should have some general idea of what cryptogamous plants are, and what are the obvious distinctions of the principal families. Although the lower grades are difficult, and need special books and good microscopes for their study, the higher orders, such as Ferns, may be determined almost as readily as phanerogamous plants.

482. Linnæus gave to this lower grade of plants the name of *Cryptogamia*, thereby indicating that their organs answering to stamens and pistils, if they had any, were recondite and unknown. There is no valid reason why this long-familiar name should not be kept up, along with the counterpart one of *Phanerogamia* (6), although organs analogous to stamens and pistil, or rather to pollen and ovule, have been discovered in all the higher and most of the lower grades of this series of plants. So also the English synonymous name of *Flowerless Plants* is both good and convenient: for they have not flowers in the proper sense. The essentials of flowers are stamens and pistils, giving rise to seeds, and the essential of a seed is an embryo (8). Cryptogamous or Flowerless plants are propagated by Spores; and a spore is not an embryo-plantlet, but mostly a single plant-cell (399).

483. Vascular Cryptogams, which compose the higher orders of this series of plants, have stems and (usually) leaves, constructed upon the general plan of ordinary plants; that is, they have wood (wood-cells and vessels, 408) in the stem and leaves, in the latter as a frame work of veins. But the lower grades, having only the more elementary cellular structure, are called *Cellular Cryptogams*. Far the larger number of the former are Ferns: wherefore that class has been called

484. Pteridophyta, Pteridophytes in English form, meaning *Fern-plants*, — that is, Ferns and their relatives. They are mainly Horsetails, Ferns, Club-Mosses, and various aquatics which have been called *Hydropterides*, i. e. Water-Ferns.

485. Horsetails, *Equisetaceæ*, is the name of a family which consists only (among now-living plants) of *Equisetum*, the botanical name of Horsetail and Scouring Rush. They have hollow stems, with partitions at the nodes; the leaves consist only of a whorl of scales at each node, these coalescent into a sheath: from the axils of these leaf-scales, in many species, branches grow out, which are similar to the stem but on a much smaller scale, close-jointed, and with the tips of the leaves more apparent. At the apex of the stem appears the *fructification*, as it is called for lack of a better term, in the form of a short spike or head. This consists of a good number of stalked shields, bearing on their inner or under face several wedge-shaped spore-cases. The spore-cases when they ripen open down the inner

side and discharge a great number of green spores of a size large enough to be well seen by a hand-glass. The spores are aided in their discharge

and dissemination by four club-shaped threads attached to one part of them These are hygrometric: when moist they are rolled up over the spore; when dry they straighten, and exhibit lively movements, closing over the spore when breathed upon, and unrolling promptly a moment after as they dry. (See Fig. 493–498.)

500

486. **Ferns, or Filices,** a most attractive family of plants, are very numerous and varied. In warm and equable climates some rise into forest-trees, with habit of Palms; but most of them are perennial herbs. The wood of a Fern-trunk is very different, however, from that of a palm, or of any exogenous stem either. A section is represented in Fig. 500. The curved plates of wood each ter-

Fig. 493. Upper part of a stem of a Horsetail, Equisetum sylvaticum. 494. Part of the head or spike of spore-cases, with some of the latter taken off. 495. View (more enlarged) of under side of the shield-shaped body, bearing a circle of spore-cases. 496. One of the latter detached and more magnified. 497. A spore with the attached arms moistened. 498. Same when dry, the arms extended.

Fig. 499. A Tree-Fern, Dicksonia arborescens, with a young one near its base. In front a common herbaceous Fern (Polypodium vulgare) with its creeping stem or rootstock.

Fig. 500. A section of the trunk of a Tree-Fern.

minate upward in a leaf-stalk. The subterranean trunk or stem of any strong-growing herbaceous Fern shows a similar structure. Most Ferns are circinate in the bud; that is, are rolled up in the manner shown in Fig. 197. Uncoiling as they grow, they have some likeness to a crosier.

487. The fructification of Ferns is borne on the back or under side of the leaf. The early botanists thought this such a peculiarity that they

always called a **Fern-leaf** a FROND, and its petiole a STIPE. Usage continues these terms, although they are superfluous. The fruit of Ferns consists of SPORE-CASES, technically SPORANGIA, which grow out of the veins of the leaf. Sometimes these are distributed over the whole lower

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FIG. 501. The Walking-Fern, Camptosorus, reduced in size, showing its fruit-dots on the veins approximated in pairs. 502. A small piece (pinnule) of a Shield-Fern: a row of fruit-dots on each side of the midrib, each covered by its kidney-shaped indusium. 503. A spore-case from the latter, just bursting by the partial straightening of the incomplete ring; well magnified. 504. Three of the spores of 509, more magnified. 505. Schizæa pusilla, a very small and simple-leaved Fern, drawn nearly of natural size. 506. One of the lobes of its fruit-bearing portion, magnified, bearing two rows of spore-cases. 507. Spore-case of the latter, detached, opening lengthwise. 508. Adder-tongue, Ophioglossum: spore-cases in a kind of spike: *a*, a portion of the fruiting part, about natural size; showing two rows of the firm spore-cases, which open transversely into two valves.

surface of the leaf or frond, or over the whole surface when there are no proper leaf-blades to the frond, but all is reduced to stalks. Commonly the spore-cases occupy only detached spots or lines, each of which is called a SORUS, or in English merely a Fruit-dot. In many Ferns these fruit-dots are naked; in others they are produced under a scale-like bit of membrane, called an INDUSIUM. In Maidenhair-Ferns a little lobe of the leaf is folded back over each fruit-dot, to serve as its shield or indusium. In the true Brake or Bracken (Pteris) the whole edge of the fruit-bearing part of the leaf is folded back over it like a hem.

488. The form and structure of the spore-cases can be made out with a common hand magnifying glass. The commonest kind (shown in Fig 503) has a stalk formed of a row of jointed cells, and is itself composed of a layer of thin-walled cells, but is incompletely surrounded by a border of thicker-walled cells, forming the RING. This extends from the stalk up one side of the spore-case, round its summit, descends on the other side, but there gradually vanishes. In ripening and drying the shrinking of the cells of the ring on the outer side causes it to straighten; in doing so it tears the spore-case open on the weaker side and discharges the minute spores that fill it, commonly with a jerk which scatters them to the wind. Another kind of spore-case (Fig. 507) is stalkless, and has its ring-cells forming a kind of cap at the top: at maturity it splits from top to bottom by a regular dehiscence. A third kind is of firm texture and opens across into two valves, like a clam-shell (Fig. 508[a]): this kind makes an approach to the next family.

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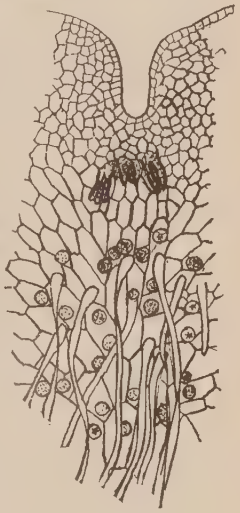

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489. The spores germinate on moistened ground. In a conservatory they may be found germinating on a damp wall or on the edges of a well-watered flower-pot. Instead of directly forming a fern-plantlet, the spore grows first into a body which

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FIG. 509. A young prothallus of a Maiden-hair, moderately enlarged, and an older one with the first fern-leaf developed from near the notch. 510. Middle portion of the young one, much magnified, showing below, partly among the rootlets, the *antheridia* or fertilizing organs, and above, near the notch, three *pistillidia* to be fertilized.

closely resembles a small Liverwort. This is named a PROTHALLUS (Fig. 509): from some point of this a bud appears to originate, which produces the first fern-leaf, soon followed by a second and third, and so the stem and leaves of the plant are set up.

490. Investigation of this prothallus under the microscope resulted in the discovery of a wholly unsuspected kind of fertilization, taking place at

this germinating stage of the plant. On the under side of the prothallus two kinds of organs appear (Fig. 510). One may be likened to an open and depressed ovule, with a single cell at bottom answering to nucleus; the other, to an anther; but instead of pollen, it discharges corkscrew-shaped microscopic filaments, which bear some cilia of extreme tenuity, by the rapid vibration of which the filaments move freely over a wet surface. These filaments travel over the surface of the prothallus, and even to other prothalli (for there are natural hybrid Ferns), reach and enter the ovule-

FIG. 511. Lycopodium Carolinianum, of nearly natural size. 512. Inside view of one of the bracts and spore-case, magnified.

FIG. 513. Open 4-valved spore-case of a Selaginella, and its four large spores (macrospores), magnified. 514. Macrospores of another Selaginella. 515. Same separated.

FIG. 516. Plant of Isoetes. 517. Base of a leaf and contained sporocarp filled with microspores cut across, magnified. 518. Same divided lengthwise, equally magnified; some microspores seen at the left. 519. Section of a spore-case containing macrospores, equally magnified; at the right three macrospores more magnified.

like cavities, and fertilize the cell. This thereupon sets up a growth, forms a vegetable bud, and so develops the new plant.

491. An essentially similar process of fertilization has been discovered in the preceding and the following families of Pteridophytes; but it is mostly subterranean and very difficult to observe.

492. **Club-Mosses or Lycopodiums.** Some of the common kinds, called Ground Pine, are familiar, being largely used for Christmas wreaths and other decoration. They are low evergreens, some creeping, all with considerable wood in their stems: this thickly beset with small leaves. In the axils of some of these leaves, or more commonly, in the axils of peculiar leaves changed into bracts (as in Fig. 511, 512) spore-cases appear, as roundish or kidney-shaped bodies, of firm texture, opening round the top into two valves, and discharging a great quantity of a very fine yellow powder, the spores.

493. The Selaginellas have been separated from Lycopodium, which they much resemble, because they produce two kinds of spores, in separate spore-cases. One kind (MICROSPORES) is just that of Lycopodium; the other consists of only four large spores (MACROSPORES), in a spore-case which usually breaks in pieces at maturity (Fig. 513–515).

494. **The Quillworts, Isoetes** (Fig. 516–519), are very unlike Club Mosses in aspect, but have been associated with them. They look more like Rushes, and live in water, or partly out of it. A very short stem, like a corm, bears a cluster of roots underneath; above it is covered by the broad bases of a cluster of awl-shaped or thread-shaped leaves. The spore-cases are immersed in the bases of the leaves. The outer leaf-bases contain numerous macrospores; the inner are filled with innumerable microspores.

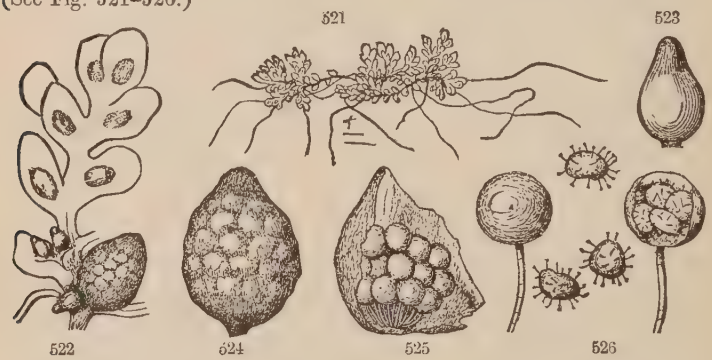
520

495. **The Pillworts** (*Marsilia* and *Pilularia*) are low aquatics, which

FIG. 520. Plant of Marsilia quadrifoliata, reduced in size; at the right a pair of sporo-carps of about natural size.

bear globular or pill-shaped fruit (Sporocarps) on the lower part of their leaf-stalks or on their slender creeping stems. The leaves of the commoner species of Marsilia might be taken for four-leaved Clover. (See Fig. 520.) The sporocarps are usually raised on a short stalk. Within they are divided lengthwise by a partition, and then crosswise by several partitions. These partitions bear numerous delicate sacs or spore-cases of two kinds, intermixed. The larger ones contain each a large spore, or macrospore; the smaller contain numerous microspores, immersed in mucilage. At maturity the fruit bursts or splits open at top, and the two kinds of spores are discharged. The large ones in germination produce a small prothallus; upon which the contents of the microspores act in the same way as in Ferns, and with a similar result.

496. Azolla is a little floating plant, looking like a small Liverwort or Moss. Its branches are covered with minute and scale-shaped leaves. On the under side of the branches are found egg-shaped thin-walled sporocarps of two kinds. The small ones open across and discharge microspores; the larger burst irregularly, and bring to view globose spore-cases, attached to the bottom of the sporocarp by a slender stalk. These delicate spore-cases burst and set free about four macrospores, which are fertilized at germination, in the manner of the Pillworts and Quillworts. (See Fig. 521–526.)



497. Cellular Cryptogams (483) are so called because composed, even in their higher forms, of cellular tissue only, without proper wood-cells or vessels. Many of the lower kinds are mere plates, or ribbons, or simple rows of cells, or even single cells. But their highest orders follow the plan of Ferns and phanerogamous plants in having stem and leaves for their upward growth, and commonly roots, or at least rootlets,

Fig. 521. Small plant of Azolla Caroliniana. 522. Portion magnified, showing the two kinds of sporocarp; the small ones contain microspores; 523 represents one more magnified. 524. The larger sporocarp more magnified. 525. Same more magnified and burst open, showing stalked spore-cases. 526. Two of the latter highly magnified; one of them bursting shows four contained macrospores; between the two, three of these spores highly magnified.

to attach them to the soil, or to trunks, or to other bodies on which they grow. Plants of this grade are chiefly Mosses. So as a whole they take the name of

498. **Bryophyta, Bryophytes** in English form, Bryum being the Greek name of a Moss. These plants are of two principal kinds: true Mosses (*Musci*, which is their Latin name in the plural); and Hepatic Mosses, or Liverworts (*Hepaticæ*).

499. **Mosses or Musci.** The pale Peat-mosses (species of Sphagnum, the principal component of sphagnous bogs) and the strong-growing Hair-cap Moss (Polytrichum) are among the larger and commoner representatives of this numerous family; while Fountain Moss (Fontinalis) in running water sometimes attains the length of a yard or more. On the other hand, some are barely individually distinguishable to the naked eye. Fig. 527 represents a common little Moss, enlarged to about twelve times its natural size; and by its side is part of a leaf, much magnified, showing that it is composed of cellular tissue (parenchyma-cells) only. The leaves of Mosses are always simple, distinct, and sessile on the stem. The fructification is an urn-shaped spore-case, in this as in most cases raised on a slender stalk The spore-case loosely bears on its summit a thin and pointed cap, like a candle-extinguisher, called a *Calyptra*. Detaching this, it is found that the spore-case is like a pyxis (376), that is, the top at maturity comes off as a lid (*Operculum*); and that the interior is filled with a green powder, the spores, which are discharged through the open mouth. In most Mosses there is a fringe of one or two rows of teeth or membrane around this mouth or orifice, the *Peristone*. When moist the peristome closes hygrometrically over the orifice more or less; when drier the teeth or processes commonly bend outward or recurve; and then the spores more readily escape. In Hair-cap Moss a membrane is stretched quite across the mouth, like a drum-head, retaining the spores until this wears away. See Figures 527–541 for details.

528 527

500. Fertilization in Mosses is by the analogues of stamens and pistils, which are hidden in the axils of leaves, or in the cluster of leaves at the

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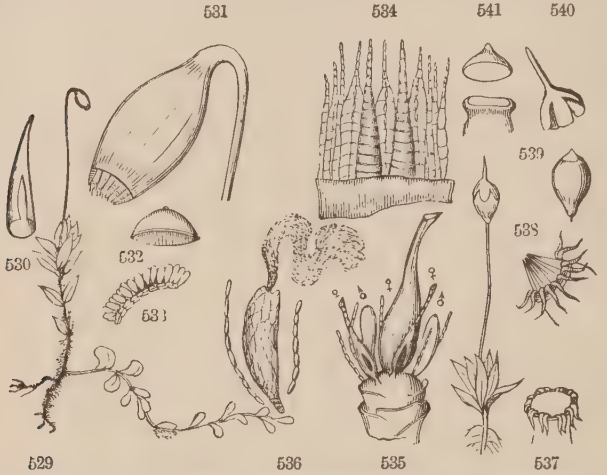
FIG. 527. Single plant of Physcomitrium pyriforme, magnified. 528. Top of a leaf, cut across; it consists of a single layer of cells.

end of the stem. The analogue of the anther (*Antheridium*) is a cellular sac, which in bursting discharges innumerable delicate cells floating in a mucilaginous liquid; each of these bursts and sets free a vibratile self-



moving thread. These threads, one or more, reach the orifice of the pistil-shaped body, the *Pistillidium*, and act upon a particular cell at its base within. This cell in its growth develops into the spore-case and its stalk (when there is any), carrying on its summit the wall of the pistillidium, which becomes the calyptra.

501. **Liverworts or Hepatic Mosses** (*Hepaticæ*) in some kinds resemble true Mosses, having distinct stem and leaves, although their leaves occasionally run together; while in others there is no distinction of stem and leaf, but the whole plant is a leaf-like body, which produces rootlets on the lower face and its fructification on the upper. Those of the moss-like kind (sometimes called Scale-Mosses) have their tender spore-cases splitting into four valves; and with their spores are intermixed some slender spiral

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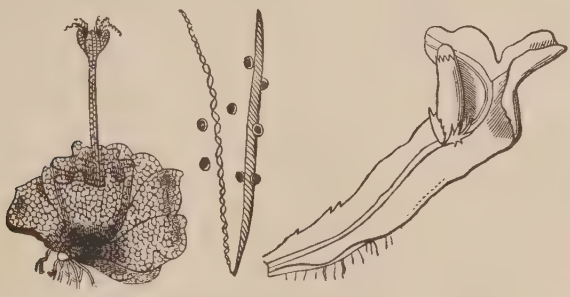
FIG. 529. Mnium cuspidatum, smaller than nature. 530. Its calyptra, detached, enlarged. 531. Its spore-case, with top of stalk, magnified, the lid (532) being detached, the outer peristome appears. 533. Part of a cellular ring (*annulus*) which was under the lid, outside of the peristome, more magnified. 534. Some of the outer and of the inner peristome (consisting of jointed teeth) much magnified. 535. Antheridia and a pistillidium (the so-called flower) at end of a stem of same plant, the leaves torn away (♂, antheridia, ♀. pistillidium), magnified. 536. A bursting antheridium, and some of the accompanying jointed threads, highly magnified. 537. Summit of an open spore-case of a Moss, which has a peristome of 16 pairs of teeth. 538. The double peristome of a Hypnum. 539–541. Spore-case, detached calyptra, and top of more enlarged spore-case and detached lid, of Physcomitrium pyriforme (Fig. 527): orifice shows that there is no peristome.

and very hygrometric threads (called *Elaters*) which are thought to aid in the dispersion of the spores. (Fig. 542–544.)

502. Marchantia, the commonest and largest of the true Liverworts, forms large green plates or fronds on damp and shady ground, and sends up from some part of the upper face a stout stalk, ending in a several-lobed umbrella-shaped body, under the lobes of which hang several thin-walled spore-cases, which burst open and discharge spores and elaters. Riccia natans (Fig. 545) consists of wedge-shaped or heart-shaped fronds, which float free in pools of still water. The under face bears copious rootlets; in the substance of the upper face are the spore-cases, their pointed tips



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merely projecting: there they burst open, and discharge their spores. These are comparatively few and large, and are in fours; so they are very like the macrospores of Pillworts or Quillworts.

503. **Thallophyta, or Thallophytes** in English form. This is the name for the lower class of Cellular Cryptogams, — plants in which there is no marked distinction into root, stem, and leaves. Roots in any proper sense they never have, as organs for absorbing, although some of the larger Seaweeds (such as the Sea Colander, Fig. 553) have them as holdfasts. Instead of axis and foliage, there is a stratum of frond, in such plants commonly called a THALLUS (by a strained use of a Greek and Latin word which means a green shoot or bough), which may have any kind of form, leaf-like, stem-like, branchy, extended to a flat plate, or gathered into a sphere, or drawn out into threads, or reduced to a single row of cells, or even reduced to single cells. Indeed, Thallophytes are so multifarious, so numerous in kinds, so protean in their stages and transformations, so recondite in their fructification, and many so microscopic in size, either of

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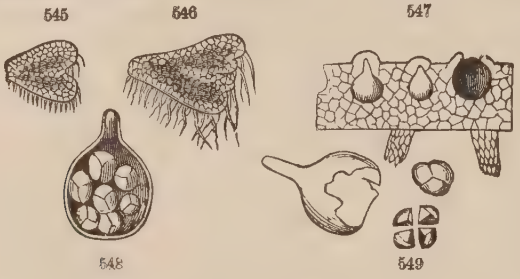
FIG. 542. Fructification of a Jungermannia, magnified; its cellular spore-stalk, surrounded at base by some of the leaves, at summit the 4-valved spore-case opening, discharging spores and elaters. 543. Two elaters and some spores from the same, highly magnified.

FIG. 544. One of the frondose Liverworts, Steetzia, otherwise like a Jungermannia; the spore-case not yet protruded from its sheath.

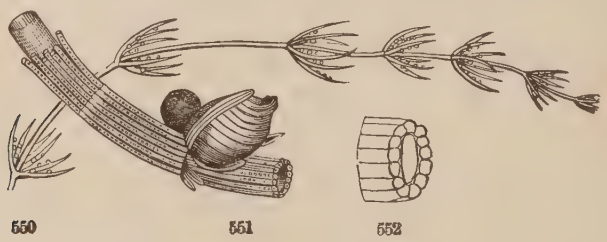
the plant itself or its essential organs, that they have to be elaborately described in separate books and made subjects of special study.

504. Nevertheless, it may be well to try to give some general idea of what Algæ and Lichens and Fungi are. Linnæus had them all under the orders of Algæ and Fungi. Afterwards the Lichens were separated; but



of late it has been made most probable that a Lichen consists of an Alga and a Fungus conjoined. At least it must be so in some of the ambiguous forms. Botanists are in the way of bringing out new classifications of the Thallophytes, as they come to understand their structure and relations better. Here, it need only be said that

505. Lichens live in the air, that is, on the ground, or on rocks, trunks, walls, and the like, and grow when moistened by rains. They assimilate air, water, and some earthy matter, just as do ordinary plants. Algæ, or Sea-



weeds, live in water, and live the same kind of life as do ordinary plants. Fungi, whatever medium they inhabit, live as animals do, upon organic matter, — upon what other plants have assimilated, or upon the products of

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Fig. 545, 546. Two plants of Riccia natans, about natural size. 547. Magnified section of a part of the frond, showing two immersed spore-cases, and one emptied space. 548. Magnified section of a spore-case with some spores. 549. Magnified spore-case torn out, and spores; one figure of the spores united; the other of the four separated.

Fig. 550. Branch of a Chara, about natural size. 551. A fruiting portion, magnified, showing the structure; a sporocarp, and an antheridium. 552. Outlines of a portion of the stem in section, showing the central cell and the outer o. cortical cells

their decay. True as these general distinctions are, it is no less true that these orders run together in their lowest forms; and that Algæ and Fungi may be traced down into forms so low and simple that no clear line can be drawn between them; and even into forms of which it is uncertain whether they should be called plants or animals. It is as well to say that they are not high enough in rank to be distinctively either the one or the other. On the other hand there is a peculiar group of plants, which in simplicity of composition resemble the simpler Algæ, while in fructification and in the arrangements of their simple cells into stem and branches they seem to be of a higher order, viz.: —

506. **Characeæ.** These are aquatic herbs, of considerable size, abounding in ponds. The simpler kinds (Nitella) have the stem formed of a single row of tubular cells, and at the nodes, or junction of the cells, a whorl of similar branches. Chara (Fig. 550–552) is the same, except that the cells which make up the stem and the principal branches are strengthened by a coating of many smaller tubular cells, applied to the surface of the main or central cell. The fructification consists of a globular sporocarp of considerable size, which is spirally

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enwrapped by tubular cells twisted around it: by the side of this is a smaller and globular antheridium. The latter breaks up into eight shield-

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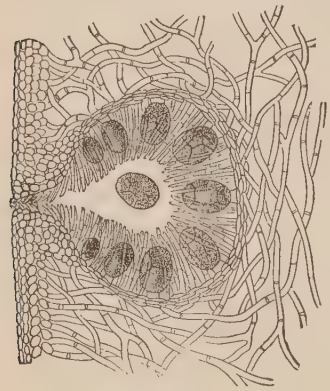
Fig. 553. Agarum Turneri, Sea Colander (so called from the perforations with which the frond, as it grows, becomes riddled); very much reduced in size.

Fig. 554. Upper end of a Rockweed, Fucus vesiculosus, reduced half or more, *b*, the fructification.

shaped pieces, with an internal stalk, and bearing long and ribbon-shaped filaments, which consist of a row of delicate cells, each of which discharges a free-moving microscopic thread (the analogue of the pollen or pollen-tube), nearly in the manner of Ferns and Mosses. One of these threads reaches and fertilizes a cell at the apex of the nucleus or solid body of the sporocarp. This subsequently germinates and forms a new individual.

507. **Algæ or Seaweeds.** The proper Seaweeds may be studied by the aid of Professor Farlow's "Marine Algæ of New England;" the



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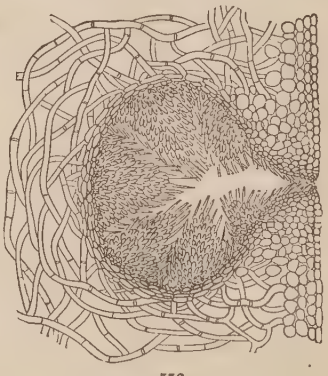

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fresh-water species, by Prof. H. C. Woods's "Fresh-water Algæ of North America," a larger and less accessible volume. A few common forms are here very briefly mentioned and illustrated, to give an idea of the family. But they are of almost endless diversity.

508. The common Rockweed (Fucus vesiculosus, Fig. 554, abounding between high and low water mark on the coast), the rarer Sea Colander (Agarum Turneri, Fig. 553), and Laminaria, of which the larger forms are called Devil's Aprons, are good representatives of the olive green or brownish Seaweeds. They are attached either by a disk-like base or by root-like holdfasts to the rocks or stones on which they grow.

509. The hollow and inflated places in the Fucus vesiculosus or Rockweed (Fig. 554) are air-bladders for buoyancy. The fructification forms in the substance of the tips of the frond: the rough dots mark the places where the conceptacles open. The spores and the fertilizing cells are in different plants. Sections of the two kinds of conceptacles are given in Fig. 555 and 556. The contents of the conceptacles are discharged through

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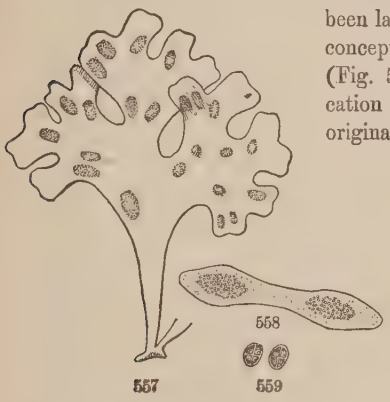
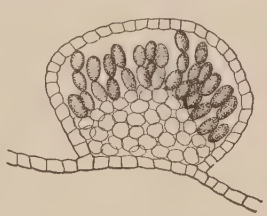
FIG. 555. Magnified section through a fertile conceptacle of Rockweed, showing the large spores in the midst of threads of cells. 556. Similar section of a sterile conceptacle, containing slender antheridia. From Farlow's "Marine Algæ of New England."

a small orifice which in each figure is at the margin of the page. The large spores are formed eight together in a mother-cell. The minute motile filaments of the antheridia fertilize the large spores after injection into the water: and then the latter promptly acquire a cell-wall and germinate.

510. The Florideæ or Rose-red series of marine Algæ (which, however, are sometimes green or brownish) are the most attractive to amateurs. The delicate Porphyra or Laver is in some countries eaten as a delicacy, and the cartilaginous Chondrus crispus has been largely used for jelly. Besides their conceptacles, which contain true spores (Fig. 560), they mostly have a fructification in *Tetraspores*, that is, of spores originating in fours (Fig. 559).





511. The Grass-green Algæ sometimes form broad membranous fronds, such as those of the common Ulva of the sea-shore, but most of them form

mere threads, either simple or branched. To this division belong almost

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Fig. 557. Small plant of Chondrus crispus, or Carrageen Moss, reduced in size, in fruit; the spots represent the fructification, consisting of numerous tetraspores in bunches in the substance of the plant. 558. Section through the thickness of one of the lobes, magnified, passing through two of the imbedded fruit-clusters. 559. Two of its tetraspores (spores in fours), highly magnified.

Fig. 560. Section through a conceptacle of Delesseria Leprieurei, much magnified, showing the spores, which are single specialized cells, two or three in a row.

Fig. 561. A piece of the rose-red Delesseria Lepreiurei, double natural size. 562. A piece cut out and much magnified, showing that it is composed of a layer of cells. 563. A few of the cells more highly magnified: the cells are gelatinous and thick-walled.

all the Fresh-water Algæ, such as those which constitute the silky threads or green slime of running streams or standing pools, and which were all called Confervas before their immense diversity was known. Some are formed of a single row of cells, developed each from the end of another. Others branch, the top of one cell producing more than one new one (Fig. 564). Others, of a kind which is very common in fresh water, simple threads made of a line of cells, have the chlorophyll and protoplasm of each cell arranged in spiral lines or bands. They form spores in a peculiar way, which gives to this family the designation of conjugating Algæ.

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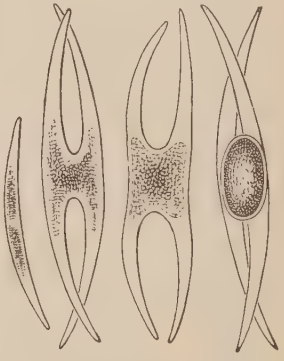
512. At a certain time two parallel threads approach each other more closely; contiguous parts of



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a cell of each thread bulge or grow out, and unite when they meet; the cell-wall partitions between them are absorbed so as to open a free communication; the spiral band of green matter in both cells breaks up; the whole of that of one cell passes over into the other; and of the united contents a large green spore is formed. Soon the old cells decay, and the spore

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Fig. 564. The growing end of a branching Conferva (Cladophora glomerata), much magnified; showing how, by a kind of budding growth, a new cell is formed by a cross partition separating the newer tip from the older part below; also, how the branches arise.

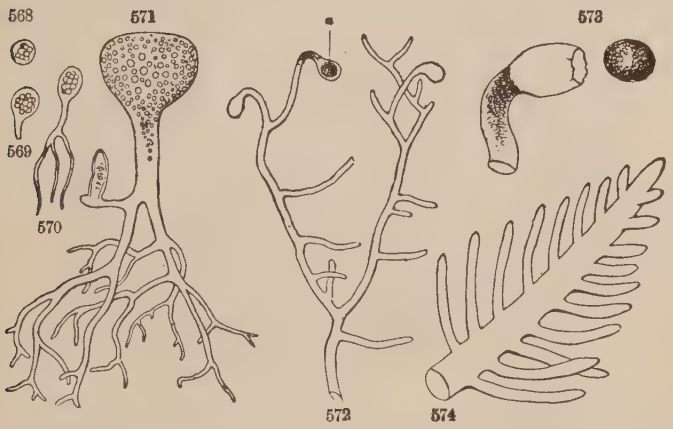
Fig. 565. Two magnified individuals of a Spirogyra, forming spores by conjugation; a completed spore at base: above, successive stages of the conjugation are represented.

Fig. 566. Closterium acutum, a common Desmid, moderately magnified. It is a single firm-walled cell, filled with green protoplasmic matter.

Fig. 567. More magnified view of three stages of the conjugation of a pair of the same.

set free is ready to germinate. Fig. 565 represents several stages of the conjugating process, which, however, would never be found all together like this in one pair of threads.

513. Desmids and Diatomes, which are microscopic one-celled plants of the same class, conjugate in the same way, as is shown in a Closterium by Fig. 566, 567. Here the whole living contents of two individuals are incorporated into one spore, for a fresh start. A reproduction which costs the life of two individuals to make a single new one would be fatal to the species if there were not a provision for multiplication by the prompt division of the new-formed individual into two, and these again into two, and so on in geometrical ratio. And the costly process would be meaningless if there were not some real advantage in such a fresh start, that is, in sexes.



514. There are other Algæ of the grass-green series which consist of single cells, but which by continued growth form plants of considerable size. Three kinds of these are represented in Fig. 568–574.

515. Lichens, Latin *Lichenes*, are to be studied in the works of the late Professor Tuckerman, but a popular exposition is greatly needed. The subjoined illustrations (Fig. 575–580) may simply indicate what some of the commoner forms are like. The cup, or shield-shaped spot, or knob, which bears the fructification is named the *Apothecium*. This is mainly

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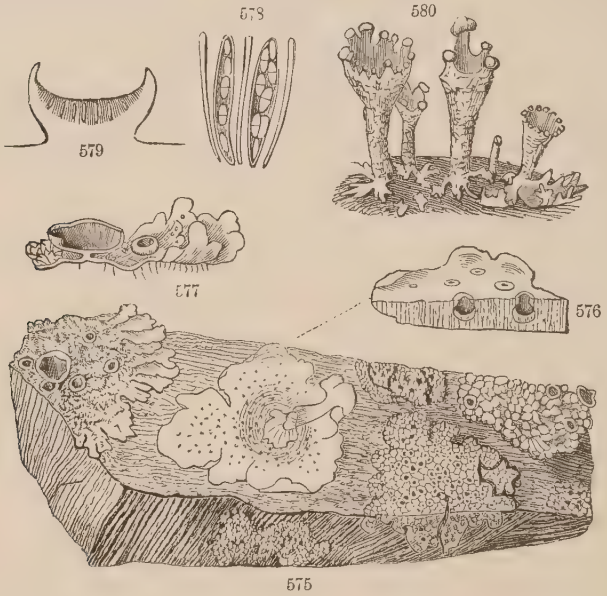
Fig. 568. Early stage of a species of Botrydium, a globose cell. 569, 570. Stages of growth. 571. Full-grown plant, extended and ramified below in a root-like way. 572. A Vaucheria; single cell grown on into a much-branched thread; the end of some branches enlarging, and the green contents in one (*a*) there condensed into a spore. 573. More magnified view of *a*, and the mature spore escaping. 574. Bryopsis plumosa; apex of a stem with its branchlets; all the extension of one cell. Variously magnified.

composed of slender sacs (*Asci*), having thread-shaped cells intermixed; and each ascus contains few or several spores, which are commonly double or treble. Most Lichens are flat expansions of grayish hue; some of them foliaceous in texture, but never of bright green color; more are crustaceous; some are wholly pulverulent and nearly formless. But in several the vegetation lengthens into an axis (as in Fig. 580), or imitates stem



and branches or threads, as in the Reindeer-Moss on the ground in our northern woods, and the Usnea hanging from the boughs of old trees overhead.

516. **Fungi.** For this immense and greatly diversified class, it must here suffice to indicate the parts of a Mushroom, a Sphæria, and of one or two common Moulds. The true vegetation of common Fungi consists of slender cells which form what is called a *Mycelium*. These filamentous

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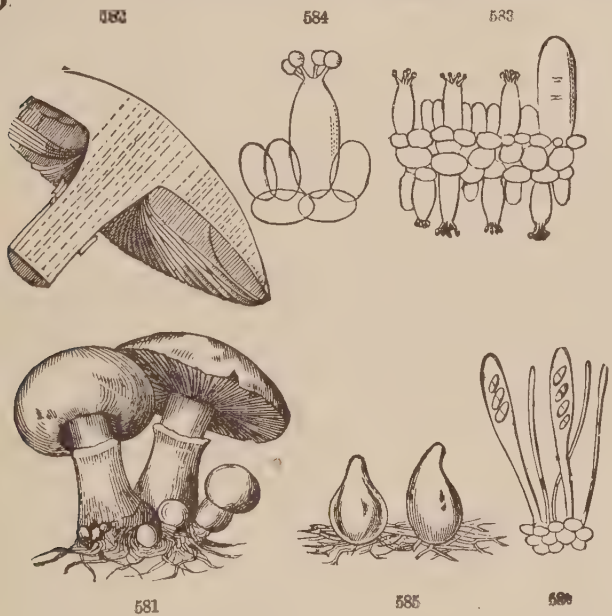
Fig. 575. A stone on which various Lichens are growing, such as (passing from left to right) a Parmelia, a Sticta, and on the right, Lecidia geographica, so called from its patches resembling the outline of islands or continents as depicted upon maps. 576. Piece of thallus of Parmelia conspersa, with section through an apothecium. 577. Section of a smaller apothecium, enlarged. 578. Two asci of same, and contained spores, and accompanying filaments; more magnified. 579. Piece of thallus of a Sticta, with section, showing the immersed apothecia; the small openings of these dot the surface. 580. Cladonia coccinea; the fructification is in the scarlet knobs, which surround the cups.

cells lengthen and branch, growing by the absorption through their whole surface of the decaying, or organizable, or living matter which they feed upon. In a Mushroom (Agaricus), a knobby mass is at length formed, which develops into a stout stalk (*Stipe*), bearing the cap (*Pileus*): the under side of the cap is covered by the *Hymenium*, in this genus consisting of radiating plates, the gills or *Lamellæ;* and these bear the powdery spores in immense numbers. Under the microscope, the gills are found to be studded with projecting cells, each of which, at the top, produces four stalked spores. These form the powder which collects on a sheet of paper upon which a mature Mushroom is allowed to rest for a day or two. (Fig. 581–586.)

517. The esculent Morel, also Sphæria (Fig. 585, 586), and many other Fungi bear their spores in sacs (asci) exactly in the manner of Lichens (515).



518. Of the Moulds, one of the commoner is the Bread Mould (Fig 587). In fruiting it sends up a slender stalk, which bears a globular sac;

Fig. 581. Agaricus campestris, the common edible Mushroom. 582. Section of cap and stalk. 583. Minute portion of a section of a gill, showing some spore-bearing cells, much magnified. 584. One of these, with its four spores, more magnified.

Fig. 585. Sphæria rosella. 586. Two of the asci and contained double spores, quite like those of a Lichen; much magnified.

this bursts at maturity and discharges innumerable spores. The blue Cheese-Mould (Fig. 588) bears a cluster of branches at top, each of which is a row of naked spores, like a string of beads, all breaking apart at maturity. Botrytis (Fig. 589), the fruiting stalk of which branches, and each branch is tipped with a spore, is one of the many moulds which live and feed upon the juices of other plants or of animals, and are often very destructive The extremely numerous kinds of smut, rust, mildew, the ferments, bacteria, and the like, many of them very destructive to other vegetable and to animal life, are also low forms of the class of Fungi.[1]

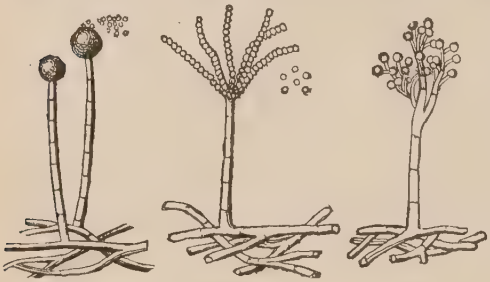


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FIG. 587. Ascophora, the Bread-Mould. 588. Aspergillus glaucus, the mould of cheese, but common on mouldy vegetables. 589. A species of Botrytis. All magnified.

[1] The "Introduction to Cryptogamous Botany," or third volume of "The Botanical Text Book," now in preparation by the author's colleague, Professor Farlow, will be the proper guide in the study of the Flowerless Plants, especially of the Algæ and Fungi.

Section XVIII. CLASSIFICATION AND NOMENCLATURE.

519. Classification, in botany, is the consideration of plants in respect to their kinds and relationships. Some system of Nomenclature, or naming, is necessary for fixing and expressing botanical knowledge so as to make it available. The vast multiplicity of plants and the various degrees of their relationship imperatively require order and system, not only as to *names* for designating the kinds of plants, but also as to *terms* for defining their differences. Nomenclature is concerned with the names of plants. Terminology supplies names of organs or parts, and terms to designate their differences.

§ 1. KINDS AND RELATIONSHIP.

520. Plants and animals have two great peculiarities: 1st, they form themselves; and 2d, they multiply themselves. They reproduce their kind in a continued succession of

521. **Individuals.** Mineral things occur as *masses*, which are divisible into smaller and still smaller ones without alteration of properties. But organic things (vegetables and animals) exist as *individual beings*. Each owes its existence to a parent, and produces similar individuals in its turn. So each individual is a link of a chain; and to this chain the natural-historian applies the name of

522. **Species.** All the descendants from the same stock therefore compose one species. And it was from our observing that the several sorts of plants or animals steadily reproduce themselves, or, in other words, keep up a succession of similar individuals, that the idea of species originated. There are few species, however, in which man has actually observed the succession for many generations. It could seldom be proved that all the White Pine trees or White Oaks of any forest came from the same stock. But observation having familiarized us with the general fact that individuals proceeding from the same stock are essentially alike, we infer from their close resemblance that these similar individuals belong to the same species. That is, we infer it when the individuals are as much like each other as those are which we know, or confidently suppose, to have sprung from the same stock.

523. Identity in species is inferred from close similarity in all essential respects, or whenever the differences, however considerable, are not known or reasonably supposed to have been originated in the course of time under changed conditions. No two individuals are exactly alike; a tendency to variation pervades all living things. In cultivation, where variations are looked after and cared for, very striking differences come to light; and if in wild nature they are less common or less conspicuous, it is partly because they are uncared for When such variant forms are pretty well marked they are called

524. **Varieties.** The White Oak, for example, presents two or three varieties in the shape of the leaves, although they may be all alike upon each particular tree. The question often arises, and it is often hard to answer, whether the difference in a particular case is that of a variety, or is specific. If the former, it may commonly be proved by finding such intermediate degrees of difference in various individuals as to show that no clear distinction can be drawn between them; or else by observing the variety to vary back again in some of its offspring. The sorts of Apples, Pears, Potatoes, and the like, show that differences which are permanent in the individual, and continue unchanged through a long series of generations when propagated by division (as by offsets, cuttings, grafts, bulbs, tubers, etc.), are not likely to be reproduced by seed. Still they sometimes are so, and perhaps always tend in that direction. For the fundamental law in organic nature is that offspring shall be like parent.

Races are such strongly marked varieties, capable of coming true to seed. The different sorts of Wheat, Maize, Peas, Radishes, etc., are familiar examples. By selecting those individuals of a species which have developed or inherited any desirable peculiarity, keeping them from mingling with their less promising brethren, and selecting again the most promising plants raised from their seeds, the cultivator may in a few generations render almost any variety transmissible by seed, so long as it is cared for and kept apart. In fact, this is the way the cultivated domesticated races, so useful to man, have been fixed and preserved. Races, in fact, can hardly, if at all, be said to exist independently of man. But man does not really produce them. Such peculiarities — often surprising enough — now and then originate, we know not how (the plant *sports*, as the gardeners say); they are only preserved, propagated, and generally further developed, by the cultivator's skilful care. If left alone, they are likely to dwindle and perish, or else revert to the original form of the species. Vegetable races are commonly annuals, which can be kept up only by seed, or herbs of which a succession of generations can be had every year or two, and so the education by selection be completed without great lapse of time. But all fruit-trees could probably be fixed into races in an equal number of generations.

Bud-varieties are those which spring from buds instead of seed. They are uncommon to any marked extent. They are sometimes called *Sports*, but this name is equally applied to variations among seedlings.

Cross-breeds, strictly so-called, are the variations which come from cross-fertilizing one variety of a species with another.

Hybrids are the varieties, if they may be so called, which come from the crossing of species (331). Only nearly related species can be hybridized; and the resulting progeny is usually self-sterile, but not always. Hybrid plants, however, may often be fertilized and made prolific by the pollen of one or the other parent. This produces another kind of cross-breeds.

525 Species are the units in classification. Varieties, although of

utmost importance in cultivation and of considerable consequence in the flora of any country, are of less botanical significance. For they are apt to be indefinite and to shade off one form into another. But species, the botanist *expects* to be distinct. Indeed, the practical difference to the botanist between species and varieties is the definite limitation of the one and the indefiniteness of the other. The botanist's determination is partly a matter of observation, partly of judgment.

526. In an enlarged view, varieties may be incipient species; and nearly related species probably came from a common stock in earlier times. For there is every reason to believe that existing vegetation came from the more or less changed vegetation of a preceding geological era. However that may be, species are regarded as permanent and essentially unchanged in their succession of individuals through the actual ages.

527. There are, at nearly the lowest computation, as many as one hundred thousand species of phanerogamous plants, and the cryptogamous species are thought to be still more numerous. They are all connected by resemblances or relationships, near and remote, which show that they are all parts of one system, realizations in nature, as we may affirm, of the conception of One Mind. As we survey them, they do not form a single and connected chain, stretching from the lowest to the highest organized species, although there obviously are lower and higher grades. But the species throughout group themselves, as it were, into clusters or constellations, and these into still more comprehensive clusters, and so on, with gaps between. It is this clustering which is the ground of the recognition of *kinds* of species, that is, of groups of species of successive grades or degree of generality; such as that of similar species into *Genera*, of genera into *Families* or *Orders*, of orders into *Classes*. In classification the sequence, proceeding from higher or more general to lower or special, is always Class, Order, Genus, Species, Variety (if need be).

528. **Genera** (in the singular, *Genus*) are assemblages of closely related species, in which the essential parts are all constructed on the same particular type or plan. White Oak, Red Oak, Scarlet Oak, Live Oak, etc., are so many species of the Oak genus (Latin, *Quercus*). The Chestnuts compose another genus; the Beeches another. The Apple, Pear, and Crab are species of one genus, the Quince represents another, the various species of Hawthorn a third. In the animal kingdom the common cat, the wild-cat, the panther, the tiger, the leopard, and the lion are species of the cat kind or genus; while the dog, the jackal, the different species of wolf, and the foxes, compose another genus. Some genera are represented by a vast number of species, others by few, very many by only one known species. For the genus may be as perfectly represented in one species as in several, although, if this were the case throughout, genera and species would of course be identical. The Beech genus and the Chestnut genus would be just as distinct from the Oak genus even if but one Beech and one Chestnut were known; as indeed was once the case.

529. **Orders** are groups of genera that resemble each other; that is, they are to genera what genera are to species. As familiar illustrations, the Oak, Chestnut, and Beech genera, along with the Hazel genus and the Hornbeams, all belong to one order. The Birches and the Alders make another; the Poplars and Willows, another; the Walnuts (with the Butternut) and the Hickories, still another. The Apple genus, the Quince and the Hawthorns, along with the Plums and Cherries and the Peach, the Raspberry with the Blackberry, the Strawberry, the Rose, belong to a large order, which takes its name from the Rose. Most botanists use the names "Order" and "Family" synonymously; the latter more popularly, as "the Rose Family," the former more technically, as "Order *Rosaceæ*."

530. But when the two are distinguished, as is common in zoölogy, Family is of lower grade than Order.

531. **Classes** are still more comprehensive assemblages, or great groups. Thus, in modern botany, the Dicotyledonous plants compose one class, the Monocotyledonous plants another (36–40).

532. These four grades, Class, Order, Genus, Species, are of universal use. Variety comes in upon occasion. For, although a species may have no recognized varieties, a genus implies at least one species belonging to it; every genus is of some order, and every order of some class.

533. But these grades by no means exhaust the resources of classification, nor suffice for the elucidation of all the distinctions which botanists recognize. In the first place, a higher grade than that of class is needful for the most comprehensive of divisions, that of all plants into the two *Series* of Phanerogamous and Cryptogamous (6); and in natural history there are the two *Kingdoms* or *Realms*, the Vegetable and the Animal.

534. Moreover, the stages of the scaffolding have been variously extended, as required, by the recognition of assemblages lower than class but higher than order, viz. *Subclass* and *Cohort;* or lower than order, a *Suborder;* or between this and genus, a *Tribe;* or between this and tribe, a *Subtribe;* or between genus and species, a *Subgenus;* and by some a species has been divided into *Subspecies*, and a variety into *Subvarieties*. Last of all are *Individuals*. Suffice it to remember that the following are the principal grades in classification, with the proper sequence; also that only those here printed in small capitals are fundamental and universal in botany: —

SERIES,
CLASS, Subclass, Cohort,
ORDER, or FAMILY, Suborder, Tribe, Subtribe,
GENUS, Subgenus or Section,
SPECIES, Variety.

§ 2. NAMES, TERMS, AND CHARACTERS.

535. The name of a plant is the name of its genus followed by that of the species. The name of the genus answers to the surname (or family name); that of the species to the baptismal name of a person. Thus *Quercus* is the name of the Oak genus; *Quercus alba*, that of the White Oak, *Q. rubra*, that of Red Oak, *Q. nigra*, that of the Black-Jack, etc. Botanical names being Latin or Latinized, the adjective name of the species comes after that of the genus.

536. **Names of Genera** are of one word, a substantive. The older ones are mostly classical Latin, or Greek adopted into Latin; such as *Quercus* for the Oak genus, *Fagus* for the Beech, *Corylus*, the Hazel, and the like. But as more genera became known, botanists had new names to make or borrow. Many are named from some appearance or property of the flowers, leaves, or other parts of the plant. To take a few examples from the early pages of the "Manual of the Botany of the Northern United States," — the genus *Hepatica* comes from the shape of the leaf, resembling that of the liver. *Myosurus* means mouse-tail. *Delphinium* is from delphin, a dolphin, and alludes to the shape of the flower, which was thought to resemble the classical figures of the dolphin. *Xanthorrhiza* is from two Greek words meaning yellow-root, the common name of the plant. *Cimicifuga* is formed of two Latin words meaning to drive away bugs, i. e Bugbane, the Siberian species being used to keep away such vermin *Sanguinaria*, the Bloodroot, is named from the blood-like color of its juice. Other genera are dedicated to distinguished botanists or promoters of science, and bear their names: such are *Magnolia*, which commemorates the early French botanist, Magnol; and *Jeffersonia*, named after President Jefferson, who sent the first exploring expedition over the Rocky Mountains. Others bear the name of the discoverer of the plant; as, *Sarracenia*, dedicated to Dr. Sarrazin, of Quebec, who was one of the first to send the common Pitcher-plant to the botanists of Europe; and *Claytonia*, first made known by the early Virginian botanist Clayton.

537. **Names of Species.** The name of a species is also a single word, appended to that of the genus. It is commonly an adjective, and therefore agrees with the generic name in case, gender, etc. Sometimes it relates to the country the species inhabits; as, Claytonia *Virginica*, first made known from Virginia; Sanguinaria *Canadensis*, from Canada, etc. More commonly it denotes some obvious or characteristic trait of the species; as, for example, in Sarracenia, our northern species is named *purpurea*, from the purple blossoms, while a more southern one is named *flava*, because its petals are yellow; the species of Jeffersonia is called *diphylla*, meaning two-leaved, because its leaf is divided into two leaflets. Some species are named after the discoverer, or in compliment to a botanist who has made them known; as, Magnolia *Fraseri*, named after the botanist Fraser, one

of the first to find this species; and Sarracenia *Drummondii*, for a Pitcher-plant found by Mr. Drummond in Florida. Such personal specific names are of course written with a capital initial letter. Occasionally some old substantive name is used for the species; as Magnolia *Umbrella*, the Umbrella tree, and Ranunculus *Flammula*. These are also written with a capital initial, and need not accord with the generic name in gender. Geographical specific names, such as *Canadensis*, *Caroliniana*, *Americana*, in the later usage are by some written without a capital initial, but the older usage is better, or at least more accordant with English orthography.

538. **Varietal Names**, when any are required, are made on the plan of specific names, and follow these, with the prefix *var.* Ranunculus Flammula, var. *reptans*, the creeping variety: R. abortivus, var. *micranthus*, the small-flowered variety of the species.

539. In recording the name of a plant it is usual to append the name, or an abbreviation of the name, of the botanist who first published it; and in a flora or other systematic work, this reference to the source of the name is completed by a further citation of the name of the book, the volume and page where it was first published. So "*Ranunculus acris*, L.," means that this Buttercup was first so named and described by Linnæus; "*R. multifidus*, Pursh," that this species was so named and published by Pursh. The suffix is no part of the name, but is an abbreviated reference, to be added or omitted as convenience or definiteness may require. The authority for a generic name is similarly recorded. Thus, "*Ranunculus*, L.," means that the genus was so named by Linnæus; "*Myosurus*, Dill.," that the Mouse-tail was established as a genus under this name by Dillenius; *Caulophyllum*, Michx., that the Blue Cohosh was published under this name by Michaux. The full reference in the last-named instance would be, "in Flora Boreali-Americana, first volume, 205th page," — in the customary abbreviation, "Michx. Fl. i. 205."

540. **Names of Orders** are given in the plural number, and are commonly formed by prolonging the name of a genus of the group taken as a representative of it. For example, the order of which the Buttercup or Crowfoot genus, *Ranunculus*, is the representative, takes from it the name of *Ranunculaceæ*; meaning *Plantæ Ranunculaceæ* when written out in full, that is, Ranunculaceous Plants. Some old descriptive names of orders are kept up, such as *Cruciferæ* for the order to which Cress and Mustard belong, from the cruciform appearance of their expanded corolla, and *Umbelliferæ*, from the flowers being in umbels.

541. **Names of Tribes**, also of suborders, subtribes, and the like, are plurals of the name of the typical genus, less prolonged, usually in *eæ*, *neæ*, *ideæ*, etc. Thus the proper Buttercup tribe is *Ranunculeæ*, of the Clematis tribe, *Clematideæ*. While the Rose family is *Rosaceæ*, the special Rose tribe is *Roseæ*.

542. **Names of Classes, etc.** For these see the following synopsis of the actual classification adopted, p. 183.

543. So a plant is named in two words, the generic and the specific names, to which may be added a third, that of the variety, upon occasion. The generic name is peculiar: obviously it must not be used twice over in botany. The specific name must not be used twice over in the same genus, but is free for any other genus. A *Quercus alba*, or White Oak, is no hindrance to *Betula alba*, or White Birch; and so of other names.

544. **Characters and Descriptions.** Plants are *characterized* by a terse statement, in botanical terms, of their peculiarities or distinguishing marks. The character of the order should include nothing which is common to the whole class it belongs to; that of the genus, nothing which is common to the order; that of the species nothing which is shared with all other species of the genus; and so of other divisions. *Descriptions* may enter into complete details of the whole structure.

545. **Terminology**, also called *Glossology*, is nomenclature applied to organs or parts, and their forms or modifications. Each organ or special part has a substantive name of its own: shapes and other modifications of an organ or part are designated by adjective terms, or, when the forms are peculiar, substantive names are given to them. By the correct use of such botanical terms, and by proper subordination of the characters under the order, genus, species, etc., plants may be described and determined with much precision. The classical language of botany is Latin. While modern languages have their own names and terms, these usually lack the precision of the Latin or Latinized botanical terminology. Fortunately, this Latinized terminology has been largely adopted and incorporated into the English technical language of botany, thus securing precision. And these terms are largely the basis of specific names of plants.

546. A glossary or vocabulary of the principal botanical terms used in phanerogamous and vascular cryptogamous botany is appended to this volume, to which the student may refer, as occasion arises.

§ 3. SYSTEM.

547. **Two systems of classification used to be recognized in botany, — the artificial and the natural; but only the latter is now thought to deserve the name of a system.**

548. Artificial classifications have for object merely the ascertaining of the name and place of a plant. They do not attempt to express relationships, but serve as a kind of dictionary. They distribute the genera and species according to some one peculiarity or set of peculiarities (just as a dictionary distributes words according to their first letters), disregarding all other considerations. At present an artificial classification in botany is needed only as a key to the natural orders, — as an aid in referring an unknown plant to its proper family; and such keys are still very needful, at least for the beginner. Formerly, when the orders themselves were not clearly made out, an artificial classification was required to lead the

student down to the genus. Two such classifications were long in vogue: First, that of Tournefort, founded mainly on the leaves of the flower, the calyx and corolla: this was the prevalent system throughout the first half of the eighteenth century; but it has long since gone by. It was succeeded by the well-known

549. **Artificial System of Linnæus**, which was founded on the stamens and pistils. It consists of twenty-four classes, and of a variable number of orders; the classes founded mainly on the number and disposition of the stamens; the orders partly upon the number of styles or stigmas, partly upon other considerations. Useful and popular as this system was down to a time within the memory of still surviving botanists, it is now completely obsolete. But the tradition of it survives in the names of its classes, Monandria, Diandria, Triandria, etc., which are familiar in terminology in the adjective terms monandrous, diandrous, triandrous, etc. (284); also of the orders, Monogynia, Digynia, Trigynia, etc., preserved in the form of monogynous, digynous, trigynous, etc. (301); and in the name Cryptogamia, that of the 24th class, which is continued for the lower series in the natural classification.

550. **Natural System.** A genuine system of botany consists of the orders or families, duly arranged under their classes, and having the tribes, the genera, and the species arranged in them according to their relationships. This, when properly carried out, is the *Natural System;* because it is intended to express, as well as possible, the various degrees of relationship among plants, as presented in nature; that is, to rank those species and those genera, etc., next to each other in the classification which are really most alike in all respects, or, in other words, which are constructed most nearly on the same particular plan.

551. There can be only *one* natural system of botany, if by this term is meant the plan according to which the vegetable creation was called into being, with all its grades and diversities among the species, as well of past as of the present time. But there may be many natural systems, if we mean the attempts of men to interpret and express that plan, — systems which will vary with advancing knowledge, and with the judgment and skill of different botanists. These must all be very imperfect, bear the impress of individual minds, and be shaped by the current philosophy of the age. But the endeavor always is to make the classification answer to Nature, as far as any system can which has to be expressed in a definite and serial arrangement.

552. So, although the classes, orders, genera, etc., are natural, or as natural as the systematist can make them, their grouping or order of arrangement in a book, must necessarily be in great measure artificial. Indeed, it is quite impossible to arrange the orders, or even the few classes, in a single series, and yet have each group stand next to its nearest relatives on both sides.

553. Especially it should be understood that, although phanerogamous

plants are of higher grade than cryptogamous, and angiospermous or ordinary phanerogamous higher than the gymnospermous, yet there is no culmination in the vegetable kingdom, nor any highest or lowest order of phanerogamous plants.

554. The particular system most largely used at present in the classification of the orders is essentially the following: —

Series I. PHANEROGAMIA: Phanerogamous or Flowering Plants.

Class I. DICOTYLEDONES ANGIOSPERMEÆ, called for shortness in English, Dicotyledons or Dicotyls. Ovules in a closed ovary. Embryo dicotyledonous. Stem with exogenous plan of growth. Leaves reticulate-veined,

Artificial Division I. Polypetalæ, with petals mostly present and distinct. Orders about 80 in number, *Ranunculaceæ* to *Cornaceæ*.

Artificial Division II. Gamopetalæ, with gamopetalous corolla. Orders about 45, *Caprifoliaceæ* to *Plantaginaceæ*.

Artificial Division III. Apetalæ or Incompletæ, with perianth, when present, of calyx only. Orders about 35 in number, from *Nyctaginaceæ* to *Salicaceæ*.

Class II. DICOTYLEDONES GYMNOSPERMEÆ, in English Gymnosperms. No ovary or pericarp, but ovules and seeds naked, and no proper calyx nor corolla. Embryo dicotyledonous or polycotyledonous. Stem with exogenous plan of growth. Leaves mostly parallel-veined. Consists of order *Gnetaceæ*, which strictly connects with Angiospermous Dicotyls, of *Coniferæ*, and of *Cycadaceæ*.

Class III. MONOCOTYLEDONES, in English Monocotyledons or Monocotyls. Angiospermous. Embryo monocotyledonous. Stem with endogenous plan of growth. Leaves mostly parallel-veined.

Division I. Petaloideæ. Perianth complete, having the equivalent of both calyx and corolla, and all the inner series corolline. About 18 orders.

Division II. Calycinæ. Perianth complete (in two series) but not corolline, mostly thickish or glumaceous. Chiefly two orders, *Juncaceæ*, the true Rushes, and *Palmæ*, Palms.

Division III. Spadicifloræ or Nudifloræ. Perianth none, or rudimentary and incomplete: inflorescence spadiceous. Of five orders, *Typhaceæ* and *Aroideæ* the principal.

Division IV. Glumaceæ. Perianth none, or very rudimentary: glumaceous bracts to the flowers. Orders mainly *Cyperaceæ* and *Gramineæ*.

Series II. CRYPTOGAMIA: Cryptogamous or Flowerless Plants

Class I. PTERIDOPHYTA, Pteridophytes (484).

Class II. BRYOPHYTA, Bryophytes (498).

Class III. THALLOPHYTA, Thallophytes (503).

Section XIX. BOTANICAL WORK.

555. Some hints and brief instructions for the collection, examination, and preservation of specimens are added. They are especially intended for the assistance of those who have not the advantage of a teacher. They apply to phanerogamous plants and Ferns only, and to systematic botany.[1]

§ 1. COLLECTION, OR HERBORIZATION

556. As much as possible, plants should be examined in the living state, or when freshly gathered. But dried specimens should be prepared for more leisurely examination and for comparison. To the working botanist good dried specimens are indispensable.

557. Botanical Specimens, to be complete, should have root or root-stock, stem, leaves, flowers, both open and in bud, and fruit. Sometimes these may all be obtained at one gathering; more commonly two or three gatherings at different times are requisite, especially for trees and shrubs.

558. In Herborizing, a good knife and a narrow and strong trowel are needed; but a very strong knife will serve instead of a trowel or small pick for digging out bulbs, tubers, and the like. To carry the specimens, either the tin box (*vasculum*) or a portfolio, or both are required. The tin box is best for the collection of specimens to be used fresh, as in the class-room; also for very thick or fleshy plants. The portfolio is indispensable for long expeditions, and is best for specimens which are to be preserved in the herbarium.

559. The *Vasculum*, or *Botanical Collecting-box*, is made of tin, in shape like a candle-box, only flatter, or the smaller sizes like an English sandwich-case; the lid opening for nearly the whole length of one side of the box. Any portable tin box of convenient size, and capable of holding specimens a foot or fifteen inches long, will answer the purpose. The box should shut close, so that the specimens may not wilt: then it will keep leafy branches and most flowers perfectly fresh for a day or two, especially if slightly moistened. They should not be wet.

560. *The Portfolio* is best made of two pieces of solid binder's-board, covered with enamel cloth, which also forms the back, and fastened by straps and buckles. It may be from a foot to twenty inches long, from nine to eleven or twelve inches wide. It should contain a needful quantity of smooth but strong and pliable paper (thin so-called Manilla paper is best), either fastened at the back as in a book, or loose in folded sheets when not very many specimens are required. As soon as gathered, the specimens should be separately laid between the leaves or in the folded sheets, and kept under moderate pressure in the closed portfolio.

[1] For fuller directions in many particulars, see "Structural Botany," pp. 370-374.

561. Of small herbs, especially annuals, the whole plant, root and all, should be taken for a specimen. Of larger ones branches will suffice, with some leaves from near the root. Enough of the root or subterranean part of the plant should be collected to show whether it is an annual, a biennial, or a perennial. Thick roots, bulbs, tubers, or branches of specimens intended to be pressed should be thinned with a knife, or cut into slices. Keep the specimens within the length of fifteen or sixteen inches, by folding, or when that cannot be done, by cutting into lengths.

562. For Drying Specimens a good supply of soft and unsized paper is wanted; and some convenient means of applying considerable pressure. To make good dried botanical specimens, dry them as rapidly as possible between many thicknesses of sun-dried paper to absorb their moisture, under as much pressure as can be given without crushing the more delicate parts. This pressure may be had by a botanical press, of which various forms have been contrived; or by weights placed upon a board, — from forty to eighty or a hundred pounds, according to the quantity of specimens drying at the time. For use while travelling, a good portable press may be made of thick binders' boards for the sides, and the pressure may be applied by strong straps with buckles. Still better, on some accounts, are portable presses made of wire network, which allow the dampness to escape by evaporation between the meshes. For herborization in a small way, a light wire-press may be taken into the field and made to serve also as a portfolio.

563. It is well to have two kinds of paper, namely, *driers* of bibulous paper, stitched into pads (or the pads may be of thick carpet-paper, cut to size) and thin smooth paper, folded once; the specimens to be laid into the fold, either when gathered or on returning from the excursion. These sheets are to hold the specimens until they are quite dry. Every day, or at first even twice a day, the specimens, left undisturbed in their sheets, are to be shifted into fire-dried or sun-dried fresh driers, and the pressure renewed, while the moist sheets are spread out to dry, so as to take their turn again at the next shifting. This course must be continued until the specimens are no longer moist to the touch. Good and comely specimens are either made or spoiled within the first twenty-four or thirty-six hours. After that, when plenty of driers are used, it may not be necessary to change them so frequently.

564. Succulent plants, which long refuse to part with life and moisture, and Spruces and some other evergreens which are apt to cast off their leaves, may be plunged for a moment into boiling water, all but the flowers. Delicate flowers may be encased in thin tissue paper when put into the press. Thick parts, like the heads of Sun-flowers and Thistles, may be cut in two or into slices.

565. Dried specimens may be packed in bundles, either in folded paper or upon single half-sheets. It is better that such paper should not be bibulous. The packages should be well wrapped or kept in close cases.

566. **Poisoning** is necessary if specimens are to be permanently preserved from the depredation of insects. The usual application is an almost saturated solution of corrosive sublimate in 95 per cent alcohol, freely applied with a large and soft brush, or the specimens dipped into some of the solution poured into a large and flat dish; the wetted specimens to be transferred for a short time to driers.

§ 2. HERBARIUM.

567. The botanist's collection of dried specimens, ticketed with their names, place, and time of collection, and systematically arranged under their genera, orders, etc., forms a *Hortus Siccus* or *Herbarium*. It comprises not only the specimens which the proprietor has himself collected, but those which he acquires through friendly exchanges, or in other ways. The specimens of an herbarium may be kept in folded sheets of paper; or they may be fastened on half-sheets of thick and white paper, either by gummed slips, or by glue applied to the specimens themselves. The former is best for private and small herbaria; the latter for large ones which are much turned over. Each sheet should be appropriated to one species; two or more different plants should never be attached to the same sheet. The generic and specific name of the plant should be added to the lower right-hand corner, either written on the sheet, or on a ticket pasted down; and the time of collection, the locality, the color of the flowers, and any other information which the specimens themselves do not afford, should be duly recorded upon the sheet or the ticket. The sheets of the herbarium should all be of exactly the same dimensions. The herbarium of Linnæus is on paper of the common foolscap size, about eleven inches long and seven wide. This is too small. Sixteen and three eighths inches by eleven and a half inches is an approved size.

568. The sheets containing the species of each genus are to be placed in *genus-covers*, made of a full sheet of thick paper (such as the strongest Manilla-hemp paper), to be when folded of the same dimensions as the species-sheet but slightly wider: the name of the genus is to be written on one of the lower corners. These are to be arranged under the orders to which they belong, and the whole kept in closed cases or cabinets, either laid flat in compartments, like "pigeon-holes," or else placed in thick portfolios, arranged like folio volumes. All should be kept, as much as practicable, in dust-proof and insect-proof cases or boxes.

569. Fruits, tubers, and other hard parts, too thick for the herbarium, may be kept in pasteboard or light wooden boxes, in a collection apart. Small loose fruits, seeds, detached flowers, and the like may be conveniently preserved in paper capsules or envelopes, attached to the herbarium-sheets.

§ 3. INVESTIGATION AND DETERMINATION OF PLANTS.

570. **The Implements** required are a hand magnifying glass, a pocket lens of an inch or two focus, or a glass of two lenses, one of the lower and the other of the higher power; and a sharp penknife for dissection. With these and reasonable perseverance the structure of the flowers and fructification of most phanerogamous plants and Ferns can be made out. But for ease and comfort, as well as for certainty and right training, the student should have some kind of simple stage microscope, and under this make all dissections of small parts. Without it the student will be apt to fall into the bad habit of guessing where he ought to ascertain.

571. The simple microscope may be reduced to a good lens or doublet, of an inch focus, mounted over a glass stage, so that it can be moved up and down and also sidewise, and with (or without) a little mirror underneath. A better one would have one or two additional lenses (say of half and of a quarter inch focus), a pretty large stage, on the glass of which several small objects can be placed and conveniently brought under the lens; and its height or that of the lens should be adjustable by a rack-work; also a swivel-mounted little mirror beneath, which is needed for minute objects to be viewed by transmitted light.

572. For dissecting and displaying small parts on the stage of the microscope, besides a thin-bladed knife, the only tools needed are a good stock of common needles of various sizes, mounted in handles, and one or more saddler's-needles, which, being triangular, may be ground to sharp edges convenient for dissection. Also a pair of delicate-pointed forceps; those with curved points used by the dentist are most convenient. A cup of clean water is indispensable, with which to moisten or wet, or in which occasionally to float delicate parts. Small flowers, buds, fruits, and seeds of dried specimens can be dissected quite as well as fresh ones. They have only to be soaked in warm or boiling water.

573. The compound microscope is rarely necessary except in cryptogamic botany and vegetable anatomy; but it is very useful and convenient, especially for the examination of pollen. To the advanced botanist it is a necessity, to all students of botany an aid and delight.

574. **Analysis.** A few directions and hints may be given. The most important is this: In studying an unknown plant, make a complete examination of all its parts, and form a clear idea of its floral structure and that of its fruit, from pericarp down to the embryo, or as far as the materials in hand allow, before taking a step toward finding out its name and relationship by means of the keys or other helps which the Manuals and Floras provide. If it is the name merely that is wanted, the shorter way is to ask some one who already knows it. To verify the points of structure one by one as they happen to occur in an artificial key, without any preparatory investigation, is a usual but is not the best nor the surest

way. It is well to make drawings or outline sketches of the smaller parts, and especially diagrams of the plan of the flower, such as those of Fig. 225, 227, 241, 244, 275–277. For these, cross sections of the flower-bud or flower are to be made: and longitudinal sections, such as Fig. 270–274, are equally important. The dissection even of small seeds is not difficult after some practice. Commonly they need to be soaked or boiled.

575. The right appreciation of characters and terms used in description needs practice and calls for judgment. Plants do not grow exactly by rule and plummet, and measurements must be taken loosely. Difference of soil and situation are responded to by considerable variations, and other divergences occur which cannot be accounted for by the surroundings, nor be anticipated in general descriptions. Annuals may be very depauperate in dry soils or seasons, or very large when particularly well nourished. Warm and arid situations promote, and wet ones are apt to diminish pubescence. Salt water causes increased succulence. The color of flowers is apt to be lighter in shade, and brighter in open and elevated situations. A color or hue not normal to the species now and then occurs, which nothing in the conditions will account for. *A white-flowered variation of any other colored blossom may always be expected;* this, though it may be notable, no more indicates a distinct variety of the species than an albino would a variety of the human species. The numerical plan is subject to variation in some flowers; those on the plan of five may now and then vary to four or to six. Variations of the outline or lobing of leaves are so familiar that they do not much mislead. Only wider and longer observation suffices to prevent or correct mistakes in botanical study. But the weighing of evidence and the balancing of probabilities, no less than the use of the well-ordered and logical system of classification, give as excellent training to the judgment as the search for the facts themselves does to the observing powers.

§ 4. SIGNS AND ABBREVIATIONS.

576. For a full account of these, whether of former or actual use, see "Structural Botany" of the "Botanical Text Book," pp. 367, 392, as also for the principles which govern the accentuation of names. It is needful here to explain only those used in the Manuals and Floras of this country, for which the present volume is an introduction and companion. They are not numerous.

577. In arranging the species, at least those of a large genus, the divisions are denoted and graduated as follows: The sign § is prefixed to sections of the highest rank: these sections when they have names affixed to them (as PRUNUS § CERASUS) may be called subgenera. When the divisions of a genus are not of such importance, or when divisions are made under the subgenus itself, the most comprehensive ones are marked by asterisks, * for the first, * * for the second, and so on. Subdivisions are

marked with a prefixed +−; those under this head with ++; and those under this with =, if there be so many grades. A similar notation is followed in the synopsis of the genera of an order.

578. The interrogation point is used in botany to indicate doubt. Thus *Clematis crispa*, L.? expresses a doubt whether the plant in question is really the *Clematis crispa* of Linnæus. *Clematis? polypetala* expresses a doubt whether the plant so named is really a Clematis. On the other hand the exclamation point (!) is used to denote certainty whenever there is special need to affirm this.

579. For size or height, the common signs of degrees, minutes, and seconds, have been used, thus, 1°, 2′, 3″, stand respectively for a foot, two inches, and three lines or twelfths of an inch. A better way, when such brevity is needed, is to write 1^{ft}. 2^{in}. 3^{l}.

580. Signs for duration used by Linnæus were ☉ for an annual, ♂ for a biennial, ♃ for a perennial herb, ♄ for a shrub or tree. DeCandolle brought in ☉ for a plant that died after once flowering, ① if annual, ② if biennial.

581. To indicate sexes, ♂ means staminate or male plant or blossom; ♀, pistillate or female; ☿, perfect or hermaphrodite.

582. To save room it is not uncommon to use ∞ in place of "many;" thus, "Stamens ∞," for stamens indefinitely numerous: "∞ flora" for pluriflora or many-flowered. Still more common is the form "Stamens 5–20," or "Calyx 4–5-parted," for stamens from five to twenty, calyx four-parted or five-parted, and the like. Such abbreviations hardly need explanation.

583. The same may be said of such abbreviations as *Cal.* for calyx, *Cor.* for corolla, *Pet.* for petals, *St.* for stamens, *Pist.* for pistil, *Hab.* for habitat, meaning place of growth, *Herb.* for herbarium, *Hort.* for garden. Also *l. c.*, loco citato, which avoids repetition of volume and page.

584. "Structural Botany" has six pages of abbreviations of the names of botanists, mostly of botanical authors. As they are not of much consequence to the beginner, while the more advanced botanist will know the names in full, or know where to find them, only a selection is here appended.

ABBREVIATIONS OF THE NAMES OF BOTANISTS.

Adans. = Adanson.
Ait. Aitou.
All. Allioni.
Andr. Andrews.
Arn. Arnott.
Aub. Aublet.
Bartr. Bartram.
Beauv. Palisot de Beauvois.
Benth. Bentham.
Bernh. Bernhardi.
Bigel. Jacob Bigelow.
Bong. Bongard.
Bonpl. Bonpland.
Br. or *R. Br.* Robert Brown.
Cass. Cassini.
Cav. Cavanilles.
Cham. Chamisso.
Chapm. Chapman.
Chois. Choisy.
Clayt. Clayton.
Curt. Curtis.
Curt. (*M. A.*) M. A. Curtis.
Darl. Darlington.
DC., *DeCand.* DeCandolle.
A. DC. Alphonse DeCandolle.
Desc. Descourtilz.
Desf. Desfontaines.
Desv. Desvaux.
Dill. Dillenius.
Dougl. Douglas.
Duham. Duhamel.
Dun. Dunal.
Eat. Eaton (Amos) or D. C.
Ehrh. Ehrhart.
Ell. Elliott.
Endl. Endlicher.
Engelm. Engelmann.
Engl. Engler.
Fisch. Fischer.
Frœl. Frœlich.
Gærtn. Gærtner.
Gaud. Gaudin.
Gaudich. Gaudichaud.
Ging. Gingins.
Gmel. = Gmelin.
Good. Goodenough.
Grev. Greville.
Griseb. Grisebach.
Gron., *Gronov.* Gronovius.
Hall. Haller.
Hartm. Hartmann.
Hartw. Hartweg.
Harv. Harvey.
Haw. Haworth.
Hegelm. Hegelmaier.
Hemsl. Hemsley.
Herb. Herbert.
Hoffm. Hoffmann.
Hoffmans. Hoffmansegg.
Hook. Hooker.
Hook. f. J. D. Hooker.
Hornem. Hornemann.
Huds. Hudson.
Humb. Humboldt. [Kunth
HBK. Humboldt, Bonpland, and
Jacq. Jacquin.
Jacq. f. J. F. Jacquin.
Juss. Jussieu.
A. Juss. Adrien de Jussieu.
Kit. Kitaibel.
L. or *Linn.* Linnæus.
Labill. Labillardiere.
Lag. Lagasca.
Lam. Lamarck.
Ledeb. Ledebour.
Lehm. Lehmann.
Lesq. Lesquereux.
Less. Lessing.
Lestib. Lestibudois.
L'Her. L'Heritier.
Lindb. Lindberg.
Lindh. Lindheimer.
Lindl. Lindley.
Lodd. Loddiges.
Loud. Loudon.
M. Bieb. Marschall von Bieberstein.
Marsh. Marshall (Humphrey).
Mart. Martius.

Mast. = Masters.
Maxim. Maximowicz.
Meisn. } Meisner or
Meissn. } Meissner.
Michx. or *Mx.* Michaux.
Michx. f. F. A. Michaux.
Mill. Miller.
Miq. Miquel.
Mitch. Mitchell.
Moç. Moçino.
Moq. Moquin-Tandon.
Moric. Moricand.
Moris. Morison.
Muell. Arg. J. Mueller.
Muell. (F.) Ferdinand Mueller.
Muhl. Muhlenberg.
Murr. Murray.
Naud. Naudin.
Neck. Necker.
Nees } Nees von Esenbeck.
N. ab E. }
Nutt. Nuttall.
Œd. Œder.
Ort. Ortega.
P. de Beauv. Palisot de Beauvois.
Pall. Pallas.
Parl. Parlatore.
Pav. Pavon.
Pers. Persoon.
Planch. Planchon.
Pluk. Plukenet.
Plum. Plumier.
Poir. Poiret.
Radlk. Radlkofer.
Raf. Rafinesque.
Red. Redouté.
Reichenb. Reichenbach.
Rich. L. C. Richard.
Rich. f. or *A.* Achille Richard.
Richards. Richardson.
Ridd. Riddell.
Rœm. & Schult. = Rœmer & Schultes.
Rottb. Rottbœll.
Rupr. Ruprecht.
St. Hil. Saint-Hilaire.
Salisb. Salisbury.
Schk. Schkuhr.
Schlecht. Schlechtendal.
Schrad. Schrader.
Schreb. Schreber.
Schwein. Schweinitz.
Scop. Scopoli.
Spreng. Sprengel.
Sternb. Sternberg.
Steud. Steudel.
Sull. Sullivant.
Thunb. Thunberg.
Torr. Torrey.
Tourn. Tournefort.
Trautv. Trautvetter.
Trin. Trinius.
Tuck. Tuckerman.
Vaill. Vaillant.
Vent. Ventenat.
Vill. Villars.
Wahl. Wahlenberg.
Walds. Waldstein.
Wall. Wallich.
Wallr. Wallroth.
Walp. Walpers.
Walt. Walter.
Wang. Wangenheim.
Wats. Sereno Watson, unless other initials are given
Wedd. Weddell.
Wendl. Wendland.
Wiks. Wikstrom.
Willd. Willdenow.
Wulf. Wulfen.
Zucc. Zuccarini.
Zuccag. Zuccagini.

GLOSSARY AND INDEX,

OR

DICTIONARY OF THE PRINCIPAL TERMS IN DESCRIPTIVE BOTANY, COMBINED WITH AN INDEX.

For the convenience of unclassical students, the commoner Latin and Greek words (or their equivalents in English form) which enter into the composition of botanical names, as well as of technical terms, are added to this Glossary. The numbers refer to pages.

A, at the beginning of words of Greek derivation, commonly signifies a negative, or the absence of something; as *a*petalous, without petals; *a*phyllous, leafless, &c. In words beginning with a vowel, the prefix is *an*; as *an*antherous, destitute of anther.

Abnormal, contrary to the usual or the natural structure.

Aboriginal, original in the strictest sense; same as indigenous.

Abortive, imperfectly formed, or rudimentary.

Abortion, the imperfect formation or the non-formation of some part.

Abrupt, suddenly terminating; as, for instance,

Abruptly pinnate, pinnate without an odd leaflet at the end, 58.

Acantho-, spiny.

Acaulescent (acaulis), apparently stemless; the proper stem, bearing the leaves and flowers, being very short or subterranean.

Accessory, something additional; as *Accessory buds*, 30, 31; *Accessory fruits*, 118.

Accrescent, growing larger after flowering.

Accrete, grown to.

Accumbent, lying against a thing. The cotyledons are accumbent when they lie with their edges against the radicle, 128.

Acephalous, headless.

Acerose, needle-shaped, as the leaves of Pines.

Acetabuliform, saucer-shaped.

Achœnium, or *Achenium* (plural *achenia*), a one-seeded, seed-like fruit, 120.

Achlamydeous (flower), without floral envelopes, 86.

Acicular, needle-shaped; more slender than acerose.

Acinaciform, scimitar-shaped, like some bean-pods.

Acines, the separate grains of a fruit, such as the raspberry.

Acorn, the nut of the Oak, 122.

Acotyledonous, destitute of cotyledons or seed-leaves.

Acrogenous, growing from the apex, as the stems of Ferns and Mosses. *Acrogens*, or *Acrogenous Plants*, a name for the vascular cryptogamous plants, 156.

Aculeate, armed with prickles, i. e. *aculei*; as the Rose and Brier.

Aculeolate, armed with small prickles, or slightly prickly.

Acuminate, taper-pointed, 54.

Acute, merely sharp-pointed, or ending in a point less than a right angle, 54.

Adelphous (stamens), joined in a fraternity (*adelphia*); see *monadelphous*, &c.
Aden, Greek for gland. So *Adenophorous*, gland-bearing.
Adherent, sticking to, or more commonly, growing fast to another body.
Adnate, literally, growing fast to, born adherent, 95. The anther is adnate when fixed by its whole length to the filament or its prolongation, 101.
Adnation, the state of being adnate, 94.
Adpressed or *appressed*, brought into contact with, but not united.
Adscendent, *ascendent*, or *ascending*, rising gradually upwards, 39.
Adsurgent, or *assurgent*, same as ascending, 39.
Adventitious, out of the proper or usual place; e. g. *Adventitious buds*, 30.
Adventive, applied to foreign plants accidentally or sparingly introduced into a country, but hardly to be called naturalized.
Æquilateral, equal-sided; opposed to oblique.
Aerial roots, &c., 36.
Æruginous, verdigris-colored.
Æstival, produced in summer.
Æstivation, the arrangement of parts in a flower-bud, 97.
Agamous, sexless.
Aggregate fruits, 118.
Agrestis, growing in fields.
Air-cells or *Air-passages*, spaces in the tissue of leaves and some stems, 131.
Air-Plants, 36.
Akene or *Akenium*, 120.
Ala (plural, *alæ*), a wing; the side-petals of a papilionaceous corolla, 92.
Alabastrum, a flower-bud.
Alar, situated in the forks of a stem.
Alate, winged.
Albescent, whitish, or turning white.
Albus, Latin for white.
Albumen of the seed, nourishing matter stored up with the embryo, 21, 127.
Albumen, a vegetable product, of four elements.
Albuminous (seeds), furnished with albumen, 21.
Alburnum, young wood, sap-wood, 142.
Alliaceous, with odor of garlic.
Allogamous, close fertilization.
Alpestrine, subalpine.
Alpine, belonging to high mountains above the limit of forests.
Alternate (leaves), one after another, 29, 67. Petals are *alternate* with the sepals, or stamens with the petals, when they stand over the intervals between them, 82.
Alveolate, honeycomb-like.
Ament, the scaly spike of trees like the Birch and Willow, 75.
Amentaceous, catkin-like, or catkin-bearing.
Amorphous, shapeless, without any definite form.
Amphicarpous, producing two kinds of fruit.
Amphigastrium (plural, *amphigastria*), a peculiar stipule-like leaf of Liverworts.
Amphitropous, ovules or seeds, 111.
Amphora, a pitcher-shaped organ.
Amplectant, embracing. *Amplexicaul* (leaves), clasping the stem by the base.
Ampullaceous, swelling out like a bottle or bladder (*ampulla*).
Amylaceous, *Amyloid*, composed of starch (*amylum*), or starch-like.
Anandrous, without stamens.
Anantherous, without anthers. *Ananthous*, destitute of flowers; flowerless.
Anastomosing, forming a net-work (*anastomosis*), as the veins of leaves, 50.
Anatropous ovules or seeds, 111.
Ancipital (*anceps*), two-edged.
Androecium, a name for the stamens taken together, 98.

Andro-dioecious, flowers staminate on one plant, perfect on another.
Androgynous, having both staminate and pistillate flowers in the same cluster.
Androphore, a column of united stamens, as in a Mallow.
Androus, or *Ander*, *andra*, *andrum*, Greek in compounds for male, or stamens.
Anemophilous, wind-loving, said of wind-fertilizable flowers, 113.
Anfractuose, bent hither and thither as the anthers of the Squash, &c.
Angiospermæ, *Angiospermous*, with seeds formed in an ovary or pericarp, 109.
Angular divergence of leaves, 69.
Anisos, unequal. *Anisomerous*, parts unequal in number. *Anisopetalous*, with unequal petals. *Anisophyllous*, the leaves unequal in the pairs.
Annual (plant), flowering and fruiting the year it is raised from the seed, and then dying, 37.
Annular, in the form of a ring, or forming a circle.
Annulate, marked by rings; or furnished with an
Annulus, or ring, like that of the spore-case of most Ferns. In Mosses it is a ring of cells placed between the mouth of the spore-case and the lid in many species.
Annotinous, yearly, or in yearly growths.
Anterior, in the blossom, is the part next the bract, i. e. external; while the posterior side is that next the axis of inflorescence. Thus, in the Pea, &c., the keel is *anterior*, and the standard *posterior*, 96.
Anthela, an open paniculate cyme.
Anther, the essential part of the stamen, which contains the pollen, 14, 80, 101.
Antheridium (plural *antheridia*), the organ in Cryptogams which answers to the anther of Flowering Plants, 150.
Antheriferous, anther-bearing.
Anthesis, the period or the act of the expansion of a flower.
Anthocarpus (fruits), 118.
Anthophore, a stipe between calyx and corolla, 113.
Anthos, Greek for flower; in composition, *Monanthous*, one-flowered, &c.
Anticous, same as anterior.
Antrorse, directed upwards or forwards.
Apetalous, destitute of petals, 86.
Aphyllous, leafless.
Apical, belonging to the apex or point.
Apiculate, pointleted; tipped with a small point.
Apocarpous (pistils), when the several pistils of the same flower are separate.
Apophysis, any irregular swelling; the enlargement at the base of the spore-case of the Umbrella-Moss.
Apothecium, the fructification of Lichens, 171.
Appendage, any superadded part. *Appendiculate*, provided with appendages.
Appressed, close pressed to the stem, &c.
Apricus, growing in dry and sunny places.
Apterous, wingless.
Aquatic (*Aquatilis*), living or growing in water; applied to plants whether growing under water, or with all but the base raised out of it.
Arachnoid, *Araneose*, cobwebby; clothed with, or consisting of, soft downy fibres.
Arboreous, *Arborescent*, tree-like, in size or form, 39.
Arboretum, a collection of trees.
Archegonium (plural *archegonia*), the organ in Mosses, &c., which is analogous to the pistil of Flowering Plants.
Arcuate, bent or curved like a bow.
Arenose (*Arenarius*), growing in sand.
Areolate, marked out into little spaces or *areolæ*.
Argenteous, or *Argentate*, silvery-like.
Argillose, growing in clay.
Argos, Greek for pure white; *Argophyllous* or *Argyrophyllous*, white-leaved, &c.
Argutus, acutely dentate.

Arillate (seeds) furnished with an aril.
Arilliform, aril-like.
Arillus, or ***Aril***, a fleshy growth from base of a seed, 126.
Aristate, awned, i. e. furnished with an *arista*, like the beard of Barley, &c., 54.
Aristulate, diminutive of the last; short-awned.
Arrect, brought into upright position.
Arrow-shaped or ***Arrow-headed***, same as ***sagittate***, 53.
Articulated, jointed; furnished with joints or *articulations*, where it separates or inclines to do so. ***Articulated leaves***, 57.
Artificial Classification, 181.
Ascending (stems, &c.), 39; (seeds or ovules) 110.
Ascidium, a pitcher-shaped body, like leaves of Sarracenia.
Ascus (*asci*), a sac, the spore-case of Lichens and some Fungi.
Aspergilliform, shaped like the brush used to sprinkle holy water; as the stigmas of many Grasses.
Asperous, rough to touch.
Assimilation, 144, 147.
Assurgent, same as ascending, 39.
Atropous or ***Atropal*** (ovules), same as orthotropous.
Aurantiacous, orange-colored.
Aureous, golden.
Auriculate, furnished with *auricles* or ear-like appendages, 53.
Autogamy, self-fertilization, 115.
Awl-shaped, sharp-pointed from a broader base, 61.
Awn, the bristle or beard of Barley, Oats, &c.; or any similar appendage.
Awned or ***Awn-pointed***, furnished with an awn or long bristle-shaped tip, 54.
Axil, the angle on the upper side between a leaf and the stem, 13.
Axile, belonging to the axis, or occupying the axis.
Axillary (buds, &c.), occurring in an axil, 27.
Axis, the central line of any body; the organ round which others are attached; the root and stem. ***Ascending*** and ***Descending Axis***, 38.

Baccate, berried, berry-like, of a pulpy nature like a berry (*bacca*).
Badius, chestnut-colored.
Banner, see Standard, 92.
Barbate, bearded; bearing tufts, spots, or lines of hairs.
Barbed, furnished with a *barb* or double hook; as the apex of the bristle on the fruit of Echinospermum (Stickseed), &c.
Barbellate, said of the bristles of the pappus of some Compositæ when beset with short, stiff hairs, longer than when denticulate, but shorter than when plumose.
Barbellulate, diminutive of barbellate.
Bark, the covering of a stem outside of the wood, 138, 140.
Basal, belonging or attached to the
Base, that extremity of any organ by which it is attached to its support.
Basifixed, attached by its base.
Bast, ***Bast-fibres***, 134.
Beaked, ending in a prolonged narrow tip.
Bearded, see *barbate*. ***Beard*** is sometimes used for awn, more commonly for long or stiff hairs of any sort.
Bell-shaped, of the shape of a bell, as the corolla of Harebell, 90.
Berry, a fruit pulpy or juicy throughout, as a grape, 119.
Bi- (or ***Bis***), in compound words, twice; as
Biarticulate, twice-jointed, or two-jointed; separating into two pieces.
Biauriculate, having two ears, as the leaf in fig. 126.
Bicallose, having two callosities or harder spots.
Bicarinate, two-keeled.
Bicipital (*Biceps*), two-headed; dividing into two parts.

Biconjugate, twice paired, as when a petiole forks twice.
Bidentate, having two teeth (not twice or doubly dentate).
Biennial, of two years' continuance; springing from the seed one season, flowering and dying the next, 38.
Bifarious, two-ranked; arranged in two rows.
Bifid, two-cleft to about the middle.
Bifoliolate, a compound leaf of two leaflets, 59.
Bifurcate, twice forked; or more commonly, forked into two branches.
Bijugate, bearing two pairs (of leaflets, &c.).
Bilabiate, two-lipped, as the corolla of Labiatæ.
Bilamellate, of two plates (*lamellæ*), as the stigma of Mimulus.
Bilobed, the same as two-lobed.
Bilocellate, when a cell is divided into two *locelli*.
Bilocular, two-celled; as most anthers, the pod of Foxglove, &c.
Binary, in twos.
Binate, in couples, two together. *Bipartite*, the Latin form of two-parted.
Binodal, of two nodes.
Binomial, of two words, as the name of genus and species taken together, 180.
Bipalmate, twice palmately divided.
Biparous, bearing two.
Bipinnate (leaf), twice pinnate, 58. *Bipinnatifid*, twice pinnatifid, 57.
Bipinnatisect, twice pinnately divided.
Biplicate, twice folded together.
Biserial, or *Biseriate*, occupying two rows, one within the other.
Biserrate, doubly serrate, as when the teeth of a leaf are themselves serrate.
Bisexual, having both stamens and pistil.
Biternate, twice ternate; i. e. principal divisions three, each bearing three leaflets, 59
Bladdery, thin and inflated.
Blade of a leaf, its expanded portion, 49.
Bloom, the whitish powder on some fruits, leaves, &c.
Boat-shaped, concave within and keeled without, in shape like a small boat.
Border of corolla, &c., 89.
Brachiate, with opposite branches at right angles to each other.
Brachy-, short, as *Brachycarpous*, short-fruited, &c.
Bract (*Bractea*), the leaf of an inflorescence. Specially, the bract is the small leaf or scale from the axil of which a flower or its pedicel proceeds, 73.
Bracteate, furnished with bracts.
Bracteolate, furnished with bractlets.
Bracteose, with numerous or conspicuous bracts.
Bractlet (*Bracteola*), or *Bracteole*, is a bract seated *on* the pedicel or flower-stalk, 73
Branch, *Branching*, 27.
Breathing-pores, 144.
Bristles, stiff, sharp hairs, or any very slender bodies of similar appearance.
Bristly, beset with bristles. *Bristle-pointed*, 54.
Brunneous, brown.
Brush-shaped, see *aspergilliform*.
Bryology, that part of botany which relates to Mosses.
Bryophyta, *Bryophytes*, 163.
Bud, a branch in its earliest or undeveloped state, 27. *Bud-scales*, 63.
Bulb, a leaf-bud with fleshy scales, usually subterranean, 46.
Bulbils, diminutive bulbs.
Bulbiferous, bearing or producing bulbs. *Bulbose* or *bulbous*, bulb-like in shape, &c
Bulblets, small bulbs, borne above ground, 46.
Bulb-scales, 46.
Bullate, appearing as if blistered or bladdery (from *bulla*, a bubble).
Byssaceous, composed of fine flax-like threads.

Caducous, dropping off very early, compared with other parts; as the calyx in the Poppy, falling when the flower opens.
Cæruleous, blue. *Cærulescent*, becoming bluish.
Cæspitose, or *Cespitose*, growing in turf-like patches or tufts.
Calathiform, cup-shaped.
Calcarate, furnished with a spur (*calcar*), 86, 87.
Calceolate or *Calceiform*, slipper-shaped, like one petal of the Lady's Slipper.
Callose, hardened; or furnished with callosities or thickened spots.
Calvous, bald or naked of hairs.
Calyciflorus, when petals and stamens are adnate to calyx.
Calycine, belonging to the calyx.
Calyculate, furnished with an outer accessory calyx (*calyculus*) or set of bracts looking like a calyx, as in true Pinks.
Calyptra, the hood or veil of the capsule of a Moss, 163.
Calyptrate, having a calyptra.
Calyptriform, shaped like a calyptra or candle-extinguisher.
Calyx, the outer set of the floral envelopes or leaves of the flower, 14, 79.
Cambium, *Cambium-layer*, 140.
Campanulate, bell-shaped, 90.
Campylotropous, or *Campylotropal*, curved ovules and seeds, 111. *Campylospermous*, applied to fruits of Umbelliferæ when the seed is curved in at the edges, forming a groove down the inner face; as in Sweet Cicely.
Canaliculate, channelled, or with a deep longitudinal groove.
Cancellate, latticed, resembling lattice-work.
Candidus, Latin for pure white.
Canescent, grayish-white; hoary, usually because the surface is covered with fine white hairs. *Incanous* is whiter still.
Canous, whitened with pubescence; see *incanous*.
Capillaceous, *Capillary*, hair-like in shape; as fine as hair or slender bristles.
Capitate, having a globular apex, like the head on a pin.
Capitellate, diminutive of capitate.
Capitulum, a close rounded dense cluster or *head* of sessile flowers, 74.
Capreolate, bearing tendrils (from *capreolus*, a tendril).
Capsule, a dry dehiscent seed-vessel of a compound pistil, 122.
Capsular, relating to, or like a capsule.
Capture of insects, 154.
Carina, a keel; the two anterior petals of a papilionaceous flower, 92.
Carinate, keeled, furnished with a sharp ridge or projection on the lower side.
Cariopsis, or *Caryopsis*, the one-seeded fruit or grain of Grasses, 121.
Carneous, flesh-colored; pale red. *Carnose*, fleshy in texture.
Carpel, or *Carpidium*, a simple pistil or a pistil-leaf, 106.
Carpellary, pertaining to a carpel.
Carpology, that department of botany which relates to fruits.
Carpophore, the stalk or support of a pistil extending between its carpels, 113.
Carpos, Greek for fruit.
Cartilaginous, or *Cartilagineous*, firm and tough in texture, like cartilage
Caruncle, an excrescence at the scar of some seeds, 126.
Carunculate, furnished with a caruncle.
Caryophyllaceous, pink-like: applied to a corolla of 5 long-clawed petals.
Cassideous, helmet-shaped.
Cassus, empty and sterile.
Catenate, or *Catenulate*, end to end as in a chain.
Catkin, see Ament, 75.
Caudate, tailed, or tail-pointed.
Caudex, a sort of trunk, such as that of Palms; an upright rootstock, 39, 44.
Caudicle, the stalk of a pollen-mass, &c.
Caulescent, having an obvious stem, 36.

Caulicle, a little stem, or rudimentary stem (of a seedling) 11, 127.
Cauline, of or belonging to a stem, 36. *Caulis*, Latin name of stem.
Caulocarpic, equivalent to perennial.
Caulome, the cauline parts of a plant.
Cell (diminutive, *Cellule*), the cavity of an anther, ovary, &c.; one of the anatomical elements, 131.
Cellular Cryptogams, 162. *Cellular tissue*, 131.
Cellulose, 131. *Cell-walls*, 130.
Centrifugal (inflorescence), produced or expanding in succession from the centre outwards, 77.
Centripetal, the opposite of centrifugal, 74.
Cephala, Greek for head. In compounds, *Monocephalous*, with one head, *Microcephalous*, small-headed, &c.
Cereal, belonging to corn, or corn-plants.
Cernuous, nodding; the summit more or less inclining.
Chæta, Greek for bristle.
Chaff, small membranous scales or bracts on the receptacle of Compositæ; the glumes, &c., of grasses.
Chaffy, furnished with chaff, or of the texture of chaff.
Chalaza, that part of the ovule where all the parts grow together, 110, 126.
Channelled, hollowed out like a gutter; same as *canaliculate*.
Character, a phrase expressing the essential marks of a species, genus, &c., 181
Chartaceous, of the texture of paper or parchment.
Chloros, Greek for green, whence *Chloranthous*, green-flowered; *Chlorocarpous*, green-fruited, &c.
Chlorophyll, leaf green, 136.
Chlorosis, a condition in which naturally colored parts turn green.
Choripetalous, same as polypetalous.
Chorisis, separation of the normally united parts, or where two or more parts take the place of one.
Chromule, coloring matter in plants, especially when not green, or when liquid.
Chrysos, Greek for golden yellow, whence *Chrysanthous*, yellow-flowered, &c.
Cicatrix, the scar left by the fall of a leaf or other organ.
Ciliate, beset on the margin with a fringe of *cilia*, i. e. of hairs or bristles, like the eyelashes fringing the eyelids, whence the name.
Cinereous, or *Cineraceous*, ash-grayish; of the color of ashes.
Circinate, rolled inwards from the top, 72.
Circumscissile, or *Circumcissile*, divided by a circular line round the sides, as the pods of Purslane, Plantain, &c., 124.
Circumscription, general outline.
Cirrhiferous, or *Cirrhose*, furnished with a tendril (Latin, *Cirrhus*); as the Grape vine. *Cirrhose* also means resembling or coiling like tendrils, as the leaf stalks of Virgin's-bower. More properly *Cirrus* and *Cirrose*.
Citreous, lemon-yellow.
Clados, Greek for branch. *Cladophylla*, 64.
Class, 178, 183.
Classification, 175, 183.
Clathrate, latticed; same as *cancellate*.
Clavate, club-shaped; slender below and thickened upwards.
Clavellate, diminutive of clavate.
Claviculate, having *Claviculæ*, or little tendrils or hooks.
Claw, the narrow or stalk-like base of some petals, as of Pinks, 91.
Cleistogamous (*Cleistogamy*), fertilized in closed bud, 115.
Cleft, cut into lobes, 55.
Close fertilization, 115.
Climbing, rising by clinging to other objects, 39, 151.
Club-shaped, see *clavate*.
Clustered, leaves, flowers, &c., aggregated or collected into a bunch

Clypeate, buckler-shaped.
Coadunate, same as *connate*, i. e. united.
Coalescent, growing together. *Coalescence*, 88.
Coarctate, contracted or brought close together.
Coated, having an integument, or covered in layers. Coated bulb, 46.
Cobwebby, same as *arachnoid*; bearing hairs like cobwebs or gossamer
Coccineous, scarlet-red.
Coccus (plural *cocci*), anciently a berry; now mostly used to denote the separable carpels or nutlets of a dry fruit.
Cochleariform, spoon-shaped.
Cochleate, coiled or shaped like a snail-shell.
Cœlospermous, applied to those fruits of Umbelliferæ which have the seed hollowed on the inner face, by incurving of top and bottom; as in Coriander.
Coherent, usually the same as *connate*.
Cohort, name sometimes used for groups between order and class, 178.
Coleorhiza, a root-sheath.
Collateral, side by side.
Collective fruits, 118.
Collum or *Collar*, the neck or junction of stem and root.
Colored, parts of a plant which are other-colored than green.
Columella, the axis to which the carpels of a compound pistil are often attached, as in Geranium (112), or which is left when a pod opens, as in Azalea.
Column, the united stamens, as in Mallow, or the stamens and pistils united into one body, as in the Orchis family.
Columnar, shaped like a column or pillar.
Coma, a tuft of any sort (literally, a head of hair), 125.
Comose, tufted; bearing a tuft of hairs, as the seeds of Milkweed, 126.
Commissure, the line of junction of two carpels, as in the fruit of Umbelliferæ.
Complanate, flattened.
Compound leaf, 54, 57. *Compound pistil*, 107. *Compound umbel*, 75, &c.
Complete (flower), 81.
Complicate, folded upon itself.
Compressed, flattened on opposite sides.
Conceptacle, 168.
Concinnous, neat.
Concolor, all of one color.
Conchiform, shell- or half-shell- shaped.
Conduplicate, folded upon itself lengthwise, 71.
Cone, the fruit of the Pine family, 124. *Coniferous*, cone-bearing.
Confertus, much crowded.
Conferruminate, stuck together, as the cotyledons in a horse-chestnut.
Confluent, blended together; or the same as *coherent*.
Conformed, similar to another thing it is associated with or compared to; or closely fitted to it, as the skin to the kernel of a seed.
Congested, *Conglomerate*, crowded together.
Conglomerate, crowded into a glomerule.
Conjugate, coupled; in single pairs. *Conjugation*, 170.
Connate, united or grown together from the first formation, 96.
Connate-perfoliate, when a pair of leaves are connate round a stem, 60.
Connective, *Connectivum*, the part of the anther connecting its two cells, 101.
Connivent, converging, or brought close together.
Consolidation (floral), 94.
Consolidated forms of vegetation, 47.
Contents of cells, 136.
Continuous, the reverse of interrupted or articulated.
Contorted, twisted together. *Contorted æstivation*, same as *convolute*, 97.
Contortuplicate, twisted back upon itself.
Contracted, either narrowed or shortened.

Contrary, turned in opposite direction to the ordinary.
Convolute, rolled up lengthwise, as the leaves of the Plum in vernation, 72. In æstivation, same as *contorted*, 97.
Cordate, heart-shaped, 53.
Coriaceous, resembling leather in texture.
Corky, of the texture of cork. *Corky layer* of bark, 141.
Corm, a solid bulb, like that of Crocus, 45.
Corneous, of the consistence or appearance of horn.
Corniculate, furnished with a small horn or spur.
Cornute, horned; bearing a horn-like projection or appendage.
Corolla, the leaves of the flower within the calyx, 14, 79.
Corollaceous, *Corolline*, like or belonging to a corolla.
Corona, a coronet or crown; an appendage at the top of the claw of some petals, 91
Coronate, crowned; furnished with a crown.
Cortex, bark. *Cortical*, belonging to the bark (*cortex*).
Corticate, coated with bark or bark-like covering.
Corymb, a flat or convex indeterminate flower-cluster, 74.
Corymbiferous, bearing corymbs.
Corymbose, in corymbs, approaching the form of a corymb, or branched in that way
Costa, a rib; the midrib of a leaf, &c. *Costate*, ribbed.
Cotyledons, the proper leaves of the embryo, 11, 127.
Crateriform, goblet-shaped or deep saucer-shaped.
Creeping (stems), growing flat on or beneath the ground and rooting, 39.
Cremocarp, a half-fruit, or one of the two carpels of Umbelliferæ, 121.
Crenate, or *Crenelled*, the edge scalloped into rounded teeth, 55.
Crenulate, minutely or slightly crenate.
Crested, or *Cristate*, bearing any elevated appendage like a crest.
Cretaceous, chalky or chalk-like.
Cribrose, or *cribriform*, pierced like a sieve with small apertures.
Crinite, bearing long hairs.
Crispate, curled or crispy.
Croceous, saffron-color, deep reddish-yellow.
Cross-breeds, the progeny of interbred varieties, 176.
Cross fertilization, 115.
Crown, see *corona*. *Crowned*, see *coronate*.
Cruciate, or *Cruciform*, cross-shaped. *Cruciform Corolla*, 86.
Crustaceous, hard and brittle in texture; crust-like.
Cryptogamous Plants, *Cryptogams*, 10, 156.
Cryptos, concealed, as *Cryptopetalous*, with concealed petals, &c.
Crystals in plants, 137.
Cucullate, hooded, or hood-shaped, rolled up like a cornet of paper, or a hood (*cucullus*), as the spathe of Indian Turnip, 75.
Culm, a straw; the stem of Grasses and Sedges, 39.
Cultrate, shaped like a trowel or broad knife.
Cuneate, *Cuneiform*, wedge-shaped, 53.
Cup-shaped, same as cyathiform or near it.
Cupule, a little cup; the cup to the acorn of the Oak, 122
Cupular, or *Cupulate*, provided with a cupule.
Cupuliferous, cupule-bearing.
Curriveined, with curved ribs or veins.
Curviserial, in oblique or spiral ranks.
Cushion, the enlargement at the insertion or base of a petiole.
Cuspidate, tipped with a sharp and stiff point or *cusp*, 54.
Cut, same as incised, or applied generally to any sharp and deep division, 55
Cuticle, the skin of plants, or more strictly its external pellicle.
Cyaneous, bright blue.
Cyathiform, in the shape of a cup, or particularly of a wine-glass.
Cycle, one complete turn of a spire, or a circle, 70.

Cyclical, rolled up circularly, or coiled into a complete circle.
Cyclosis, circulation in closed cells, 149.
Cylindraceous, approaching to the *Cylindrical* form, terete and not tapering.
Cymbæform, or *Cymbiform*, same as boat-shaped.
Cyme, a cluster of centrifugal inflorescence, 77.
Cymose, furnished with cymes, or like a cyme.
Cymule, a partial or diminutive cyme, 77.

Deca- (in words of Greek derivation), ten; as
Decagynous, with 10 pistils or styles, *Decamerous*, of 10 parts, *Decandrous*, with 10 stamens, &c.
Deciduous, falling off, or subject to fall; said of leaves which fall in autumn, and of a calyx and corolla which fall before the fruit forms.
Declinate, *declined*, turned to one side, or downwards.
Decompound, several times compounded or divided, 59.
Decumbent, reclined on the ground, the summit tending to rise, 39.
Decurrent (leaves), prolonged on the stem beneath the insertion, as in Thistles.
Decussate, arranged in pairs which successively cross each other, 71.
Deduplication, same as chorisis.
Definite, when of a uniform number, and not above twelve or so.
Definite Inflorescence, 72.
Deflexed, bent downwards.
Deflorate, past the flowering state, as an anther after it has discharged its pollen.
Dehiscence, the regular splitting open of capsule or anther, 103, 119.
Dehiscent, opening by regular dehiscence, 119, 123.
Deliquescent, branching off so that the stem is lost in the branches, 32.
Deltoid, of a triangular shape, like the Greek capital Δ.
Demersed, growing below the surface of water.
Dendroid, *Dendritic*, tree-like in form or appearance.
Dendron, Greek for tree.
Deni, ten together.
Dens, Latin for tooth.
Dentate, toothed, 55. *Denticulate*, furnished with denticulations, or little teeth.
Depauperate, impoverished or starved, and so below the natural size.
Depressed, flattened or as if pressed down from above.
Derma, Greek for skin.
Descending, tending gradually downwards. *Descending axis*, the root.
Desmos, Greek for things connected or bound together.
Determinate Inflorescence, 72.
Dextrorse, turned to the right hand.
Di- Dis (in Greek compounds) two, as
Diadelphous (stamens), united by their filaments in two sets, 99.
Diagnosis, a short distinguishing character or descriptive phrase.
Dialypetalous, same as polypetalous.
Diandrous, having two stamens, &c.
Diaphanous, transparent or translucent.
Dicarpellary, of two carpels.
Dichlamydeous (flower), having both calyx and corolla.
Dichogamous, *Dichogamy*, 116.
Dichotomous, two-forked.
Diclinous, having the stamens in one flower, the pistils in another, 85.
Dicoccous (fruit), splitting into two *cocci* or closed carpels.
Dicotyls, 23.
Dicotyledonous (embryo), having a pair of cotyledons, 23. *Dicotyledonous Plants*, 25, 182.
Didymous, twin.
Didynamous (stamens), having four stamens in two pairs, 100.
Diffuse, spreading widely and irregularly

Digitate (fingered), where the leaflets of a compound leaf are all borne on the apex of the petiole, 58.
Digynous (flower), having two pistils or styles, 105.
Dimerous, made up of two parts, or its organs in twos.
Dimidiate, halved; as where a leaf or leaflet has only one side developed.
Dimorphism, 117. *Dimorphous*, *Dimorphic*, of two forms, 117.
Diœcious, or *Dioicous*, with stamens and pistils on different plants, 85.
Dipetalous, of two petals. *Diphyllous*, two-leaved. *Dipterous*, two-winged.
Diplo-, Greek for double, as *Diplostemonous*, with two sets of stamens.
Disciform or *Disk-shaped*, flat and circular, like a disk or quoit.
Discoidal, or *Discoid*, belonging to or like a disk.
Discolor, of two different colors or hues.
Discrete, separate, opposite of concrete.
Disepalous, of two sepals.
Disk, the face of any flat body; the central part of a head of flowers, like the Sun flower, or Coreopsis, as opposed to the *ray* or margin; a fleshy expansion of the receptacle of a flower, 113.
Disk-flowers, those of the disk in Compositæ.
Dissected, cut deeply into many lobes or divisions.
Dissepiments, the partitions of a compound ovary or a fruit, 108.
Dissilient, bursting in pieces.
Distichous, two-ranked.
Distinct, uncombined with each other, 95.
Dithecous, of two thecæ or anther-cells.
Divaricate, straddling; very widely divergent.
Divided (leaves, &c.), cut into divisions down to the base or midrib, 55.
Dodeca, Greek for twelve; as *Dodecagynous*, with twelve pistils or styles, *Dodecandrous*, with twelve stamens.
Dodrans, span-long.
Dolabriform, axe-shaped.
Dorsal, pertaining to the back (*dorsum*) of an organ. *Dorsal Suture*, 106.
Dotted Ducts, 148.
Double Flowers, where the petals are multiplied unduly, 79.
Downy, clothed with a coat of soft and short hairs.
Drupaceous, like or pertaining to a drupe.
Drupe, a stone-fruit, 120. *Drupelet* or *Drupel*, a little drupe.
Ducts, the so-called vessels of plants, 134.
Dumose, bushy, or relating to bushes.
Duramen, the heart-wood, 142.
Dwarf, remarkably low in stature.

E-, as a prefix of Latin compound words, means destitute of; as *ecostate*, without a rib or midrib; *exalbuminous*, without albumen, &c.
Eared, see *auriculate*, 53.
Ebracteate, destitute of bracts. *Ebracteolate*, destitute of bractlets.
Eburneous, ivory-white.
Echinate, armed with prickles (like a hedgehog). *Echinulate*, a diminutive of it.
Edentate, toothless.
Effete, past bearing, &c.; said of anthers which have discharged their pollen.
Effuse, very loosely branched and spreading.
Eglandulose, destitute of glands.
Elaters, threads mixed with the spores of Liverworts, 165.
Ellipsoidal, approaching an elliptical figure.
Elliptical, oval or oblong, with the ends regularly rounded, 52.
Emarginate, notched at the summit, 54.
Embryo, the rudimentary plantlet in a seed, 11, 127.
Embryonal, belonging or relating to the embryo.
Embryo-sac, 117.

Emersed, raised out of water.
Endecagynous, with eleven pistils or styles. *Endecandrous*, with eleven stamens.
Endemic, peculiar to the country geographically.
Endocarp, the inner layer of a pericarp or fruit, 120.
Endochrome, the coloring matter of Algæ and the like.
Endogenous Stems, 138. *Endogenous plants*, an old name for monocotyledons.
Endopleura, inner seed-coat.
Endorhizal, radicle or root sheathed in germination.
Endosperm, the albumen of a seed, 21.
Endostome, the orifice in the inner coat of an ovule.
Ennea-, nine. *Enneagynous*, with nine petals or styles. *Enneandrous*, nine-stamened
Ensate, *Ensiform*, sword-shaped.
Entire, the margins not at all toothed, notched, or divided, but even, 55.
Entomophilous, said of flowers frequented and fertilized by insects, 113.
Ephemeral, lasting for a day or less, as the corolla of Purslane, &c.
Epi-, Greek for upon.
Epicalyx, such an involucel as that of Malvaceæ.
Epicarp, the outermost layer of a fruit, 120.
Epidermal, relating to the *Epidermis*, or skin of a plant, 50, 141, 143.
Epigæous, growing on the earth, or close to the ground.
Epigynous, upon the ovary, 95, 99.
Epipetalous, borne on the petals or the corolla, 99.
Epiphyllous, borne on a leaf.
Epiphyte, a plant growing on another plant, but not nourished by it, 38.
Epiphytic or *Epiphytal*, relating to *Epiphytes*.
Epipterous, winged at top.
Episperm, the skin or coat of a seed, especially the outer coat.
Equal, alike in number or length.
Equally pinnate, same as abruptly pinnate, 57.
Equitant (riding straddle), 60.
Erion, Greek for wool. *Erianthous*, woolly-flowered. *Eriophorous*, wool-bearing, &c
Erose, eroded, as if gnawed.
Erostrate, not beaked.
Erythros, Greek for red. *Erythrocarpous*, red-fruited, &c.
Essential Organs of the flower, 80.
Estivation, see *æstivation*.
Etiolated, blanched by excluding the light, as the stalks of Celery.
Eu, Greek prefix, meaning very, or much.
Evergreen, holding the leaves over winter and until new ones appear, or longer.
Ex, Latin prefix; privative in place of "e" when next letter is a vowel. So *Ex alate*, wingless; *Exalbuminous* (seed), without albumen, 21.
Excurrent, running out, as when a midrib projects beyond the apex of a leaf, or a trunk is continued to the very top of a tree, 32.
Exiguous, puny.
Exilis, lank or meagre.
Eximius, distinguished for size or beauty.
Exo-, in Greek compounds, outward, as in
Exocarp, outer layer of a pericarp, 120.
Exogenous, outward growing. *Exogenous stems*, 139.
Exorhizal, radicle in germination not sheathed.
Exostome, the orifice in the outer coat of the ovule.
Explanate, spread or flattened out.
Exserted, protruding out of, as the stamens out of the corolla.
Exstipulate, destitute of stipules.
Extine, outer coat of a pollen-grain.
Extra-axillary, said of a branch or bud somewhat out of the axil, 31.
Extrorse, turned outwards; the anther is extrorse when fastened to the filament on the side next the pistil, and opening on the outer side, 101.

Falcate, scythe-shaped; a flat body curved, its edges parallel.
False Racemes, 78.
Family, in botany same as Order, 177.
Farina, meal or starchy matter, 136.
Farinaceous, mealy in texture. *Farinose*, covered with a mealy powder.
Fasciate, banded; also applied to monstrous stems which grow flat.
Fascicle, a close cluster, 77.
Fascicled, *Fasciculated*, growing in a bundle or tuft, as the leaves of Larch, 68, and roots of Peony, 35.
Fastigiate, close, parallel, and upright, as the branches of Lombardy Poplar.
Faux (plural, *fauces*), the throat of a calyx, corolla, &c., 89.
Faveolate, *Favose*, honeycombed; same as *alveolate*.
Feather-veined, with veins of a leaf all springing from the sides of a midrib, 51.
Fecula or *Fœcula*, starch, 136.
Female flower or *plant*, one bearing pistils only.
Fenestrate, pierced with one or more large holes, like windows.
Ferrugineous, or *Ferruginous*, resembling iron-rust; red-grayish.
Fertile, fruit-bearing, or capable of it; also said of anthers producing good pollen.
Fertilization, the process by which pollen causes the embryo to be formed, 114.
Fibre (woody), 133. *Fibrous*, containing much fibre, or composed of fibres.
Fibrillose, formed of small fibres, or *Fibrillæ*.
Fibro-vascular bundle or tissue, formed of fibres and vessels.
Fiddle-shaped, obovate with a deep recess on each side.
Fidus, Latin suffix for cleft, as *Bifid*, two-cleft.
Filament, the stalk of a stamen, 14, 80, 101; also any slender thread-shaped body.
Filamentose, or *Filamentous*, bearing or formed of slender threads.
Filiform, thread-shaped; long, slender, and cylindrical.
Fimbriate, fringed; furnished with fringes (*fimbriæ*).
Fimbrillate, *Fimbrilliferous*, bearing small *fimbriæ*, i. e. *fimbrillæ*.
Fissiparous, multiplying by division of one body into two.
Fissus, Latin for split or divided.
Fistular, or *Fistulose*, hollow and cylindrical, as the leaves of the Onion.
Flabelliform, or *Flabellate*, fan-shaped.
Flagellate, or *Flagelliform*, long, narrow, and flexible, like the thong of a whip; or like the runners (*flagellæ*) of the Strawberry.
Flavescent, yellowish, or turning yellow.
Flavus, Latin for yellow.
Fleshy, composed of firm pulp or flesh.
Flexuose, or *Flexuous*, bending in opposite directions, in a zigzag way.
Floating, swimming on the surface of water.
Floccose, composed of or bearing tufts of woolly or long and soft hairs.
Flora (the goddess of flowers). the plants of a country or district, taken together, or a work systematically describing them, 9.
Floral Envelopes, or *Flower-leaves*, 79.
Floret, a diminutive flower, one of a mass or cluster.
Floribund, abundantly floriferous.
Florula, the flora of a small district.
Flos, *floris*, Latin for flower.
Flosculus, diminutive, same as floret.
Flower, the whole organs of reproduction of Phænogamous plants, 14, 73.
Flower-bud, an unopened flower.
Flowering Plants, 10, 156. *Flowerless Plants*, 10, 156.
Fly-trap leaves, 65.
Fluitans, Latin for floating. *Fluviatile*, belonging to a river or stream.
Foliaceous, belonging to, or of the texture or nature of, a leaf (*folium*).
Foliate, provided with leaves. Latin prefixes denote the number of leaves, as *bifoliate*, *trifoliate*, &c. *Foliose*, leafy; abounding in leaves.
Foliolate, relating to or bearing leaflets (*foliola*); *trifoliate*, with three leaflets. &c.

Folium (plural, *folia*), Latin for leaf.
Follicle, a simple pod, opening down the inner suture, 122.
Follicular, resembling or belonging to a follicle.
Food of Plants, 144.
Foot-stalk, either petiole or peduncle, 49.
Foramen, a hole or orifice, as that of the ovule, 110.
Foraminose, *Foraminulose*, pierced with holes.
Forked, branched in two or three or more.
Fornicate, bearing fornices.
Fornix, little arched scales in the throat of some corollas, as of Comfrey.
Foveate, deeply pitted. *Foveolate*, diminutive of *foveate*.
Free, not united with any other parts of a different sort, 95.
Fringed, the margin beset with slender appendages, bristles, &c.
Frond, what answers to leaves in Ferns, &c., 157; or to the stem and leaves fused into one, as in Liverwort.
Frondescence, the bursting into leaf.
Frondose, frond-bearing; like a frond, or sometimes used for leafy.
Fructification, the state or result of fruiting.
Fructus, Latin for fruit.
Fruit, the matured ovary and all it contains or is connected with, 117.
Fruit-dots in Ferns; see *Sorus*.
Frustulose, consisting of a chain of similar pieces, or *Frustules*.
Frutescent, somewhat shrubby; becoming a shrub (*Frutex*), 39.
Fruticulose, like a small shrub, or *Fruticulus*. *Fruticose*, shrubby, 39.
Fugacious, soon falling off or perishing.
Fulcrate, having accessory organs or *fulcra*, i. e. props.
Fulvous, tawny; dull yellow with gray.
Fungus, *Fungi*, 172.
Funicle, *Funiculus*, the stalk of a seed or ovule, 110.
Funnelform, or *funnel-shaped*, expanding gradually upwards into an open mouth, like a funnel or tunnel, 90.
Furcate, forked.
Furfuraceous, covered with bran-like fine scurf.
Furrowed, marked by longitudinal channels or grooves.
Fuscous, deep gray-brown.
Fusiform, spindle-shaped, 36.

Galbalus, the fleshy or at length woody cone of Juniper and Cypress.
Galea, a helmet-shaped body, as the upper sepal of the Monkshood, 87.
Galeate, shaped like a helmet.
Gamopetalous, of united petals, 89.
Gamophyllous, formed of united leaves. *Gamosepalous*, formed of united sepals, 89
Geminate, twin; in pairs.
Gemma, Latin for a bud.
Gemmation, the state of budding; budding growth.
Gemmule, a small bud; the plumule, 6.
Genera, plural of genus.
Geniculate, bent abruptly, like a knee (*genu*), as many stems.
Generic Names, 179.
Genus, a kind of a rank above species, 177.
Germ, a growing point; a young bud; sometimes the same as embryo, 127.
Germen, the old name for ovary.
Germination, the development of a plantlet from the seed, 12.
Gerontogæous, inhabiting the Old World.
Gibbous, more tumid at one place or on one side than the other
Gilvous, dirty reddish-yellow.
Glabrate, becoming glabrous with age, or almost glabrous.
Glabrous, smooth, in the sense of having no hairs, bristles, or other pubescence.

Gladiate, sword-shaped, as the leaves of Iris.
Glands, small cellular organs which secrete oily or aromatic or other products; they are sometimes sunk in the leaves or rind, as in the Orange, Prickly Ash, &c.; sometimes on the surface as small projections; sometimes raised on hairs or bristles (*glandular hairs*, *&c.*), as in the Sweetbrier and Sundew. The name is also given to any small swellings, &c., whether they secrete anything or not; so that the word is loosely used.
Glandular, *Glandulose*, furnished with glands, or gland-like.
Glans (*Gland*), the acorn or mast of Oak and similar fruits.
Glareose, growing in gravel.
Glaucescent, slightly glaucous, or bluish-gray.
Glaucous, covered with a *bloom*, viz. with a fine white powder of wax that rubs off, like that on a fresh plum, or a cabbage-leaf.
Globose, spherical in form, or nearly so. *Globular*, nearly globose.
Glochidiate, or *Glochideous*, (bristles) barbed; tipped with barbs, or with a double hooked point.
Glomerate, closely aggregated into a dense cluster.
Glomerule, a dense head-like cluster, 77.
Glossology, the department of botany in which technical terms are explained.
Glumaceous, glume-like, or glume-bearing.
Glume; Glumes are the husks or floral coverings of Grasses, or, particularly, the outer husks or bracts of each spikelet.
Glumelles, the inner husks of Grasses.
Gonophore, a stipe below stamens, 113.
Gossypine, cottony, flocculent.
Gracilis, Latin for slender.
Grain, see *Caryopsis*, 121.
Gramineous, grass-like.
Granular, composed of grains. *Granule*, a small grain.
Graveolent, heavy-scented.
Griseous, gray or bluish-gray.
Growth, 129.
Grumous, or *Grumose*, formed of coarse clustered grains.
Guttate, spotted, as if by drops of something colored.
Gymnos, Greek for naked, as
Gymnocarpous, naked-fruited. *Gymnospermous*, naked-seeded, 109.
Gymnospermous gynœcium, 109.
Gymnospermæ, or *Gymnospermous Plants*, 183.
Gynandrous, with stamens borne on, i. e. united with, the pistil, 99.
Gynœcium, a name for the pistils of a flower taken altogether, 105.
Gynobase, a depressed receptacle or support of the pistil or carpels, 114.
Gynophore, a stalk raising a pistil above the stamens, 113.
Gynostegium, a sheath around pistils, of whatever nature.
Gynostemium, name of the column in Orchids, &c., consisting of style and stigma with stamens combined.
Gyrate, coiled or moving circularly.
Gyrose, strongly bent to and fro.

Habit, the general aspect of a plant, or its mode of growth.
Habitat, the situation or country in which a plant grows in a wild state.
Hairs, hair-like growths on the surface of plants.
Hairy, beset with hairs, especially longish ones.
Halberd-shaped, see *hastate*, 53.
Halved, when appearing as if one half of the body were cut away.
Hamate, or *Hamose*, hooked; the end of a slender body bent round.
Hamulose, bearing a small hook; a diminutive of the last.
Haplo-, in Greek compounds, single; as *Haplostemonous*, having only one series of stamens.

Hastate, or *Hastile*, shaped like a halberd; furnished with a spreading lobe on each side at the base, 53.
Head, capitulum, a form of inflorescence, 74.
Heart-shaped, of the shape of a heart as painted on cards, 53.
Heart-wood, the older or matured wood of exogenous trees, 142.
Helicoid, coiled like a *helix* or snail-shell, 77.
Helmet, the upper sepal of Monkshood is so called.
Helvolous, grayish-yellow.
Hemi- in compounds from the Greek, half; e. g *Hemispherical*, &c.
Hemicarp, half-fruit, one carpel of an Umbelliferous plant, 121.
Hemitropous (ovule or seed), nearly same as *amphitropous*, 123.
Hepta- (in words of Greek origin), seven; as *Heptagynous*, with seven pistils or styles. *Heptamerous*, its parts in sevens. *Heptandrous*, having seven stamens
Herb, plant not woody, at least above ground.
Herbaceous, of the texture of an herb; not woody, 39.
Herbarium, the botanist's arranged collection of dried plants, 186.
Herborization, 184.
Hermaphrodite (flower), having stamens and pistils in the same blossom, 81.
Hesperidium, orange-fruit, a hard-rinded berry.
Hetero-, in Greek compounds, means of two or more sorts, as
Heterocarpous, bearing fruit of two kinds or shapes.
Heterogamous, bearing two or more sorts of flowers in one cluster.
Heterogony, *Heterogone*, or *Heterogonous*, with stamens and pistil reciprocally of two sorts, 116. *Heterostyled* is same.
Heteromorphous, of two or more shapes.
Heterophyllous, with two sorts of leaves.
Heterotropous (ovule), the same as *amphitropous*, 123.
Hexa- (in Greek compounds), six; as *Hexagonal*, six-angled. *Hexagynous*, with six pistils or styles. *Hexamerous*, its parts in sixes. *Hexandrous*, with six stamens. *Hexapterous*, six-winged
Hibernaculum, a winter bud.
Hiemal, relating to winter.
Hilar, belonging to the hilum.
Hilum, the scar of the seed; its place of attachment, 110, 126.
Hippocrepiform, horseshoe-shaped.
Hirsute, clothed with stiffish or beard-like hairs.
Hirtellous, minutely hirsute.
Hispid, bristly, beset with stiff hairs. *Hispidulous*, diminutive of hispid.
Histology, 9.
Hoary, grayish-white; see *canescent*, &c.
Holosericeous, all over sericeous or silky.
Homo-, in Greek compounds, all alike or of one sort.
Homodromous, running in one direction.
Homogamous, a head or cluster with flowers all of one kind.
Homogeneous, uniform in nature; all of one kind.
Homogone, or *Homogonous*, counterpart of *Heterogone* or *Homostyled*.
Homologous, of same type; thus petals and sepals are the homologues of leaves.
Homomallous (leaves, &c.), originating all round an axis, but all bent or curved to one side.
Homorphous, all of one shape.
Homotropous (embryo), curved with the seed; curved only one way.
Hood, same as *helmet* or *galea*. *Hooded*, hood-shaped; see *cucullate*.
Hooked, same as *hamate*.
Horn, a spur or some similar appendage. *Horny*, of the texture of horn.
Hortensis, pertaining to the garden.
Hortus Siccus, an herbarium, or collection of dried plants, 201.
Humifuse, *Humistrate*, spread over the surface of the ground.
Humilis, low in stature.

Hyaline, transparent, or partly so.
Hybrid, a cross-breed between two allied species, 176.
Hydrophytes, water-plants.
Hyemal, see *hiemal*.
Hymenium of a Mushroom, 172.
Hypanthium, a hollow flower-receptacle, such as that of Rose.
Hypo-, Greek prefix for under, or underneath.
Hypocotyle, or *Hypocotyl*, part of stem below the cotyledons, 11.
Hypocrateriform, properly *Hypocraterimorphous*, salver-shaped.
Hypogæan, or *Hypogæous*, produced under ground, 19.
Hypogynous, inserted under the pistil, 95, 99.
Hysteranthous, with the blossoms developed earlier than the leaves.

Icosandrous, having 20 (or 12 or more) stamens inserted on the calyx.
Imberbis, Latin for beardless.
Imbricate, *Imbricated*, *Imbricative*, overlapping one another, like tiles or shingles on a roof, as the bud-scales of Horse-chestnut and Hickory, 27. In æstivation, where some leaves of the calyx or corolla are overlapped on both sides by others, 98.
Immarginate, destitute of a rim or border.
Immersed, growing wholly under water.
Impari-pinnate, pinnate with a single leaflet at the apex, 57.
Imperfect flowers, wanting either stamens or pistils, 85.
Inæquilateral, unequal-sided, as the leaf of a Begonia.
Inane, empty, said of an anther which produces no pollen, &c.
Inappendiculate, not appendaged.
Incanous, *Incanescent*, hoary with soft white pubescence.
Incarnate, flesh-colored.
Incised, cut rather deeply and irregularly, 58.
Included, enclosed; when the part in question does not project beyond another.
Incomplete Flower, wanting calyx or corolla, 86.
Incrassated, thickened.
Incubous, with tip of one leaf lying flat over the base of the next above.
Incumbent, leaning or resting upon; the cotyledons are incumbent when the back of one of them lies against the radicle, 128; the anthers are incumbent when turned or looking inwards.
Incurved, gradually curving inwards.
Indefinite, not uniform in number, or too numerous to mention (over 12).
Indefinite or *Indeterminate Inflorescence*, 72.
Indehiscent, not splitting open; i. e. not dehiscent, 119.
Indigenous, native to the country.
Individuals, 175.
Indumentum, any hairy coating or pubescence.
Induplicate, with the edges turned inwards, 97.
Induviate, clothed with old and withered parts or *induviæ*.
Indusium, the shield or covering of a fruit-dot of a Fern, 159.
Inermis, Latin for unarmed, not prickly.
Inferior, growing below some other organ, 96.
Infertile, not producing seed, or pollen, as the case may be.
Inflated, turgid and bladdery.
Inflexed, bent inwards.
Inflorescence, the arrangement of flowers on the stem, 72.
Infra-axillary, situated beneath the axil.
Infundibuliform or *Infundibular*, funnel-shaped, 90.
Innate (anther), attached by its base to the very apex of the filament, 101.
Innovation, a young shoot, or new growth.
Insertion, the place or the mode of attachment of an organ to its support, 95, 99.
Integer, entire, not lobed. *Integerrimus*, quite entire, not serrate.

Intercellular Passages or *Spaces*, 131, 143.
Interfoliaceous, between the leaves of a pair or whorl.
Internode, the part of a stem between two nodes, 13.
Interpetiolar, between petioles.
Interruptedly pinnate, pinnate with small leaflets intermixed with larger.
Intine, inner coat of a pollen grain.
Intrafoliaceous (stipules, &c.), placed between the leaf or petiole and the stem.
Introrse, turned or facing inwards; i. e. towards the axis of the flower, 101.
Intruse, as it were pushed inwards.
Inversed or *Inverted*, where the apex is in the direction opposite to that of the organ it is compared with.
Involucel, a partial or small involucre, 76.
Involucellate, furnished with an involucel. *Involucrate*, furnished with an involucre.
Involucre, a whorl or set of bracts around a flower, umbel, or head, &c., 74, 75.
Involute, in vernation, 72; rolled inwards from the edges, 97.
Irregular Flowers, 86, 91.
Isos, Greek for equal in number. *Isomerous*, the same number in the successive circles or sets. *Isostemonous*, the stamens equal in number to the sepals or petals.

Jointed, separate or separable at one or more places into pieces, 64, &c.
Jugum (plural *Juga*), Latin for a pair, as of leaflets, — thus *Unijugate*, of a single pair; *Bijugate*, of two pairs, &c.
Julaceus, like a catkin or *Julus*.

Keel, a projecting ridge on a surface, like the keel of a boat; the two anterior petals of a papilionaceous corolla, 92.
Keeled, furnished with a keel or sharp longitudinal ridge.
Kermesine, Carmine-red.
Kernel of the ovule and seed, 110.
Key, or *Key-fruit*, a Samara, 122.
Kidney-shaped, resembling the outline of a kidney, 53.

Labellum, the odd petal in the Orchis Family.
Labiate, same as *bilabiate* or two-lipped, 92.
Labiatiflorous, having flowers with bilabiate corolla.
Labium (plural, *Labia*), Latin for lip.
Lacerate, with margin appearing as if torn.
Laciniate, slashed; cut into deep narrow lobes or *Laciniæ*.
Lactescent, producing milky juice, as does the Milkweed, &c.
Lacteus, Latin for milk-white.
Lacunose, full of holes or gaps.
Lacustrine, belonging to lakes.
Lævigate, smooth as if polished. Latin, *Lævis*, smooth, as opposed to rough.
Lageniform, gourd-shaped.
Lagopous, Latin, hare-footed; densely clothed with long soft hairs.
Lamellar or *Lamellate*, consisting of flat plates, *Lamellæ*.
Lamina, a plate or blade, the blade of a leaf, &c., 49.
Lanate, *Lanose*, woolly; clothed with long and soft entangled hairs.
Lanceolate, lance-shaped, 52.
Lanuginous, cottony or woolly.
Latent buds, concealed or undeveloped buds, 30.
Lateral, belonging to the side.
Latex, the milky juice, &c., of plants, 135.
Lax (*Laxus*), loose in texture, or sparse; the opposite of crowded.
Leaf, 49. *Leaf-buds*, 31.
Leaflet, one of the divisions or blades of a compound leaf, 57.
Leaf-like, same as *foliaceous*.
Leathery, of about the consistence of leather; coriaceous.

Legume, a simple pod which dehisces in two pieces, like that of the Pea, 122.
Leguminous, belonging to legumes, or to the Leguminous Family.
Lenticular, lens-shaped; i. e. flattish and convex on both sides
Lappaceous, bur-like.
Lasio, Greek for woolly or hairy, as *Lasianthus*, woolly-flowered.
Lateritious, brick-colored.
Laticiferous, containing latex, 138.
Latus, Latin for broad, as *Latifolius*, broad-leaved.
Leaf-scar, *Leaf stalk*, petiole.
Lenticels, lenticular dots on young bark.
Lentiginose, as if freckled.
Lepal, a made-up word for a staminode.
Lepis, Greek for a scale, whence *Lepidote*, leprous; covered with scurfy scales.
Leptos, Greek for slender; so *Leptophyllous*, slender-leaved.
Leukos, Greek for white; whence *Leucanthous*, white-flowered, &c.
Liber, the inner bark of Exogenous stems, 140.
Lid, see *operculum*.
Ligneous, or *Lignose*, woody in texture.
Ligulate, furnished with a ligule, 93.
Ligule, *Ligula*, the strap-shaped corolla in many Compositæ, 93; the membranous appendage at the summit of the leaf-sheaths of most Grasses, 57.
Limb, the border of a corolla, &c., 89.
Limbate, bordered (Latin, *Limbus*, a border).
Line, the twelfth of an inch; or French lines, the tenth.
Linear, narrow and flat, the margins parallel, 52.
Lineate, marked with parallel lines. *Lineolate*, marked with minute lines.
Lingulate, *Linguiform*, tongue-shaped.
Lip, the principal lobes of a bilabiate corolla or calyx, 92.
Litoral or *Littoral*, belonging to the shore.
Livid, pale lead-colored.
Lobe, any projection or division (especially a rounded one) of a leaf, &c.
Lobed or *Lobate*, cut into lobes, 55, 56; *Lobulate*, into small lobes.
Locellate, having *Locelli*, i. e. compartments in a cell: thus an anther-cell is often *bilocellate*.
Loculament, same as *loculus*.
Locular, relating to the cell or compartment (*Loculus*) of an ovary, &c.
Loculicidal (dehiscence), splitting down through the back of each cell, 123.
Locusta, a name for the spikelet of Grasses.
Lodicule, one of the scales answering to perianth-leaves in Grass-flowers.
Loment, a pod which separates transversely into joints, 122.
Lomentaceous, pertaining to or resembling a loment.
Lorate, thong-shaped.
Lunate, crescent-shaped. *Lunulate*, diminutive of *lunate*.
Lupuline, like hops.
Lusus, Latin for a sport or abnormal variation.
Luteolus, yellowish; diminutive of
Luteus, Latin for yellow. *Lutescent*, verging to yellow.
Lyrate, lyre-shaped; a pinnatifid leaf of an obovate or spatulate outline, the end-lobe large and roundish, and the lower lobes small, as in fig. 149.

Macros, Greek for long, sometimes also used for large; thus *Macrophyllous*, long- or large-leaved, &c.
Macrospore, the large kind of spore, when there are two kinds, 160, 161.
Maculate, spotted or blotched.
Male (flowers or plants), having stamens but no pistil.
Mammose, breast-shaped.
Marcescent, withering without falling off.
Marginal, belonging to margin.

Marginate, margined with an edge different from the rest.
Marginicidal dehiscence, 123.
Maritime, belonging to sea-coasts.
Marmorate, marbled.
Mas., *Masc.*, *Masculine*, male.
Masked, see *personate*.
Mealy, see *farinaceous*.
Median, *Medial*, belonging to the middle.
Medifixed, attached by the middle.
Medullary, belonging to, or of the nature of, pith (*Medulla*); pithy
Medullary Rays, the silver-grain of wood, 140, 141.
Medullary Sheath, a set of ducts just around the pith, 140.
Meiostemonous, having fewer stamens than petals.
Membranaceous or *Membranous*, of the texture of membrane; thin and soft.
Meniscoid, crescent-shaped.
Mericarp, one carpel of the fruit of an Umbelliferous plant, 121.
Merismatic, separating into parts by the formation of partitions across.
Merous, from the Greek for part; used with numeral prefix to denote the number of pieces in a set or circle: as *Monomerous*, of only one, *Dimerous*, with two, *Trimerous*, with three parts (sepals, petals, stamens, &c.) in each circle.
Mesocarp, the middle part of a pericarp, when that is distinguishable into three layers, 120.
Mesophlœum, the middle or green bark.
Micropyle, the closed orifice of the seed, 110, 126.
Microspore, the smaller kind of spore when there are two kinds, 161.
Midrib, the middle or main rib of a leaf, 50.
Milk-vessels, 138.
Miniate, vermilion-colored.
Mitriform, mitre-shaped: in the form of a peaked cap, or one cleft at the top.
Moniliform, necklace-shaped; a cylindrical body contracted at intervals.
Monocarpic (duration), flowering and seeding but once, 38.
Monochlamydeous, having only one floral envelope.
Monocotyledonous (embryo), with only one cotyledon, 24.
Monocotyledonous Plants, 24. *Monocotyls*, 24.
Monœcious, or *Monoicous* (flower), having stamens or pistils only, 85.
Monogynous (flower), having only one pistil, or one style, 105.
Monopetalous (flower), with the corolla of one piece, 89.
Monophyllous, one-leaved, or of one piece.
Monos, Greek for solitary or only one; thus *Monadelphous*, stamens united by their filaments into one set, 99; *Monandrous* (flower), having only one stamen, 100.
Monosepalous, a calyx of one piece; i. e. with the sepals united into one body.
Monospermous, one-seeded.
Monstrosity, an unnatural deviation from the usual structure or form.
Morphology, *Morphological Botany*, 9; the department of botany which treats of the forms which an organ may assume.
Moschate, Musk-like in odor.
Movements, 149.
Mucronate, tipped with an abrupt short point (*Mucro*), 54.
Mucronulate, tipped with a minute abrupt point; a diminutive of the last.
Multi-, in composition, many; as *Multangular*, many-angled; *Multicipital*, many-headed, &c.; *Multifarious*, in many rows or ranks; *Multifid*, many-cleft; *Multilocular*, many-celled; *Multiserial*, in many rows.
Multiple Fruits, 118, 124.
Muricate, beset with short and hard or prickly points.
Muriform, wall-like; resembling courses of bricks in a wall.
Muticous, pointless, blunt, unarmed.
Mycelium, the spawn of Fungi: i. e. the filaments from which Mushrooms, &c., originate, 172.

Naked, wanting some usual covering, as achlamydeous flowers, 86, gymnospermous seeds, 108, 125, &c.
Names in botany, 179.
Nanus, Latin for dwarf.
Napiform, turnip-shaped, 35.
Natural System, 182.
Naturalized, introduced from a foreign country, and flourishing wild.
Navicular, boat-shaped, like the glumes of most Grasses.
Necklace-shaped, looking like a string of beads; see *moniliform*.
Nectar, the sweet secretion in flowers from which bees make honey, &c.
Nectariferous, honey-bearing; or having a nectary.
Nectary, the old name for petals and other parts of the flower when of unusual shape, especially when honey-bearing. So the hollow spur-shaped petals of Columbine were called nectaries; also the curious long-clawed petals of Monkshood, 87, &c.
Needle-shaped, long, slender, and rigid, like the leaves of Pines.
Nemorose or *Nemoral*, inhabiting groves.
Nerve, a name for the ribs or veins of leaves when simple and parallel, 50.
Nerved, furnished with nerves, or simple and parallel ribs or veins, 50.
Nervose, conspicuously nerved. *Nervulose*, minutely nervose.
Netted-veined, furnished with branching veins forming network, 50, 51
Neuter, *Neutral*, sexless. *Neutral flower*, 79.
Niger, Latin for black. *Nigricans*, Latin for verging to black.
Nitid, shining.
Nival, living in or near snow. *Niveus*, snow-white.
Nodding, bending so that the summit hangs downward.
Node, a knot; the "joints" of a stem, or the part whence a leaf or a pair of leaves springs, 13.
Nodose, knotty or knobby. *Nodulose*, furnished with little knobs or knots.
Nomenclature, 175, 179.
Normal, according to rule, natural.
Notate, marked with spots or lines of a different color.
Nucamentaceous, relating to or resembling a small nut.
Nuciform, nut-shaped or nut-like.
Nucleus, the kernel of an ovule (110) or seed (127) of a cell.
Nucule, same as nutlet.
Nude, (Latin, *Nudus*), naked. So *Nudicaulis*, naked-stemmed, &c.
Nut, Latin *Nux*, a hard, mostly one-seeded indehiscent fruit; as a chestnut, butternut, acorn, 121.
Nutant, nodding.
Nutlet, a little nut; or the stone of a drupe.

Ob- (meaning over against), when prefixed to words signifies inversion; as, *Obcompressed*, flattened the opposite of the usual way; *Obcordate*, heart-shaped with the broad and notched end at the apex instead of the base, 54; *Oblanceolate*, lance-shaped with the tapering point downwards, 52.
Oblique, applied to leaves, &c., means unequal-sided.
Oblong, from two to four times as long as broad, 52.
Obovate, inversely ovate, the broad end upward, 53. *Obovoid*, solid obovate.
Obtuse, blunt or round at the end, 54.
Obverse, same as *inverse*.
Obvolute (in the bud), when the margins of one piece or leaf alternately overlap those of the opposite one.
Ocellate, with a circular colored patch, like an eye.
Ochroleucous, yellowish-white; dull cream-color.
Ocreate, furnished with *Ocreæ* (boots), or stipules in the form of sheaths, 57.
Octo-, Latin for eight, enters into the composition of *Octagynous*, with eight pistils or styles; *Octamerous*, its parts in eights; *Octandrous*, with eight stamens, &c.

Oculate, with eye-shaped marking.
Officinal, used in medicine, therefore kept in the shops.
Offset, short branches next the ground which take root, 40.
Oides, termination, from the Greek, to denote likeness; so *Dianthoides*, Pink-like.
Oleraceous, esculent, as a pot-herb.
Oligos, Greek for few; thus *Oliganthous*, few-flowered, &c.
Olivaceous, olive-green.
Oophoridium, a name for spore-case containing macrospores.
Opaque, applied to a surface, means dull, not shining.
Operculate, furnished with a lid (*Operculum*), as the spore-case of Mosses, 163.
Opposite, said of leaves and branches when on opposite sides of the stem from each other (i. e. in pairs), 29, 68. Stamens are opposite the petals, &c., when they stand before them.
Oppositifolius, situated opposite a leaf.
Orbicular, *Orbiculate*, circular in outline, or nearly so, 52.
Order, group below class, 178. *Ordinal names*, 180.
Organ, any member of the plant, as a leaf, a stamen, &c.
Organography, study of organs, 9. *Organogenesis*, that of the development of organs.
Orgyalis, of the height of a man.
Orthos, Greek for straight; thus, *Orthocarpous*, with straight fruit; *Orthostichous*, straight-ranked.
Orthotropous (ovule or seed), 111.
Osseous, of a bony texture.
Outgrowths, growths from the surface of a leaf, petal, &c.
Oval, broadly elliptical, 52.
Ovary, that part of the pistil containing the ovules or future seeds, 14, 80, 105.
Ovate, shaped like an egg, with the broader end downwards; or, in plain surfaces, such as leaves, like the section of an egg lengthwise, 52.
Ovoid, ovate or oval in a solid form.
Ovule, the body which is destined to become a seed, 14, 80, 105, 110.
Ovuliferous, ovule-bearing.

Palate, a projection of the lower lip of a labiate corolla into the throat, as in Snap-dragon, &c.
Palea (plural *paleæ*), chaff; the inner husks of Grasses; the chaff or bracts on the receptacle of many Compositæ, as Coreopsis, and Sunflower.
Paleaceous, furnished with chaff, or chaffy in texture.
Paleolate, having *Paleolæ* or paleæ of a second order, or narrow paleæ.
Palet, English term for palea.
Palmate, when leaflets or the divisions of a leaf all spread from the apex of the petiole, like the hand with the outspread fingers, 57, 58.
Palmately (veined, lobed, &c.), in a palmate manner, 51, 56.
Palmatifid, *-lobed*, *-sect*, palmately cleft, or lobed, or divided.
Paludose, inhabiting marshes. *Palustrine*, same.
Panduriform, or *Pandurate*, fiddle-shaped (which see).
Panicle, an open and branched cluster, 81.
Panicled, *Paniculate*, arranged in panicles, or like a panicle.
Pannose, covered with a felt of woolly hairs.
Papery, of about the consistence of letter-paper.
Papilionaceous, butterfly-shaped; applied to such a corolla as that of the Pea, 91.
Papilla (plural *papillæ*), little nipple-shaped protuberances.
Papillate, *Papillose*, covered with papillæ.
Pappus, thistle-down. The down crowning the achenium of the Thistle, Groundsel, &c., and whatever in Compositæ answers to calyx, whether hairs, teeth, or scales, 121.
Papyraceous, like parchment in texture.
Parallel-veined or *nerved* (leaves), 50.

Paraphyses, jointed filaments mixed with the antheridia of Mosses.
Parasitic, living as a parasite, i. e. on another plant or animal, 37.
Parenchemytous, composed of parenchyma.
Parenchyma, soft cellular tissue of plants, like the green pulp of leaves, 132.
Parietal (placentæ, &c.), attached to the walls (*parietes*) of the ovary.
Paripinnate, pinnate with an even number of leaflets.
Parted, separated or cleft into parts almost to the base, 55.
Parthenogenesis, producing seed without fertilization.
Partial involucre, same as an *involucel*; ***partial petiole***, a division of a main leaf-stalk or the stalk of a leaflet; ***partial peduncle***, a branch of a peduncle; ***partial umbel***, an umbellet, 76.
Partition, a segment of a *parted* leaf; or an internal wall in an ovary, anther, &c.
Patelliform, disk-shaped, like the *patella* or kneepan.
Patent, spreading, open. ***Patulous***, moderately spreading.
Pauci-, in composition, few; as *pauciflorous*, few-flowered, &c.
Pear-shaped, solid obovate, the shape of a pear.
Pectinate, pinnatifid or pinnately divided into narrow and close divisions, like the teeth of a comb.
Pedate, like a bird's foot; palmate or palmately cleft, with the side divisions again cleft, as in Viola pedata, &c.
Pedicel, the stalk of each particular flower of a cluster, 73.
Pedicellate, ***Pedicelled***, borne on a pedicel.
Pedalis, Latin for a foot high or long.
Peduncle, a flower-stalk, whether of a single flower or of a flower-cluster, 73.
Peduncled, ***Pedunculate***, furnished with a peduncle.
Peloria, an abnormal return to regularity and symmetry in an irregular flower; commonest in Snapdragon.
Peltate, shield-shaped; said of a leaf, whatever its shape, when the petiole is attached to the lower side, somewhere within the margin, 53.
Pelviform, basin-shaped.
Pendent, hanging. ***Pendulous***, somewhat hanging or drooping.
Penicillate, ***Penicilliform***, tipped with a tuft of fine hairs, like a painter's pencil; as the stigmas of some Grasses.
Pennate, same as pinnate. ***Penninerved*** and ***Penniveined***, pinnately veined, 51.
Penta- (in words of Greek composition), five; as ***Pentadelphous***, 99; ***Pentagynous***, with five pistils or styles; ***Pentamerous***, with its parts in fives, or on the plan of five; ***Pentandrous***, having five stamens, 112; ***Pentastichous***, in five ranks, &c.
Pepo, a fruit like the Melon and Cucumber, 119.
Perennial, lasting from year to year, 38.
Perfect (flower), having both stamens and pistils, 91.
Perfoliate, passing through the leaf, in appearance, 60.
Perforate, pierced with holes, or with transparent dots resembling holes, as an Orange-leaf.
Peri-, Greek for around; from which are such terms as
Perianth, the leaves of the flower collectively, 79.
Pericarp, the ripened ovary; the walls of the fruit, 117.
Pericarpic, belonging to the pericarp.
Perigonium, ***Perigone***, same as *perianth*.
Perigynium, bodies around the pistil; applied to the closed cup or bottle-shaped body (of bracts) which encloses the ovary of Sedges, and to the bristles, little scales, &c., of the flowers of some other Cyperaceæ.
Perigynous, the petals and stamens borne on the calyx, 95, 99.
Peripheric, around the outside, or periphery, of any organ.
Perisperm, a name for the albumen of a seed.
Peristome, the fringe of teeth to the spore-case of Mosses, 163.
Persistent, remaining beyond the period when such parts commonly fall, as the leaves of evergreens, and the calyx of such flowers as persist during the growth of the fruit.

Personate, masked; a bilabiate corolla with a *palate* in the throat, 82.
Pertuse, perforated with a hole or slit.
Perulate, having scales (*Perulæ*), such as bud-scales.
Pes, pedis, Latin for the foot or support, whence *Longipes*, long-stalked, &c.
Petal, a leaf of the corolla, 14, 79.
Petalody, metamorphosis of stamens, &c., into petals.
Petaloid, *Petaline*, petal-like; resembling or colored like petals.
Petiole, a footstalk of a leaf; a leaf stalk, 49.
Petioled, *Petiolate*, furnished with a petiole.
Petiolulate, said of a leaflet when raised on its own partial leafstalk.
Petræus, Latin for growing on rocks.
Phalanx, phalanges, bundles of stamens.
Phænogamous, or *Phanerogamous*, plants bearing flowers and producing seeds same as Flowering Plants. *Phænogams*, *Phanerogams*, 10.
Phlœum, Greek name for bark, whence *Endophlœum*, inner bark, &c.
Phœniceous, deep red verging to scarlet.
Phycology, the botany of Algæ.
Phyllocladia, branches assuming the form and function of leaves.
Phyllodium (plural, *phyllodia*), a leaf where the seeming blade is a dilated petiole, as in New Holland Acacias, 61.
Phyllome, foliar parts, those answering to leaves in their nature.
Phyllon (plural, *phylla*), Greek for leaf and leaves; used in many compound terms and names.
Phyllotaxis, or *Phyllotaxy*, the arrangement of leaves on the stem, 67.
Physiological Botany, 9.
Phytography, relates to characterizing and describing plants.
Phyton, or *Phytomer*, a name used to designate the pieces which by their repetition make up a plant, theoretically, viz. a joint of stem with its leaf or pair of leaves.
Pileus of a mushroom, 172.
Piliferous, bearing a slender bristle or hair (*pilum*), or beset with hairs.
Pilose, hairy; clothed with soft slender hairs.
Pinna, a primary division with its leaflets of a bipinnate or tripinnate leaf.
Pinnule, a secondary division of a bipinnate or tripinnate leaf, 66.
Pinnate (leaf), when leaflets are arranged along the sides of a common petiole, 57.
Pinnately lobed, cleft, parted, divided, veined, 56.
Pinnatifid, *Pinnatisect*, same as pinnately cleft and pinnately parted, 56.
Pisiform, pea-shaped.
Pistil, the seed-bearing organ of the flower, 14, 80, 105.
Pistillate, having a pistil, 85.
Pistillidium, the body which in Mosses answers to the pistil, 159, 164.
Pitchers, 64.
Pith, the cellular centre of an exogenous stem, 138.
Placenta, the surface or part of the ovary to which the ovules are attached, 107.
Placentiform, nearly same as quoit-shaped.
Plaited (in the bud), or *Plicate*, folded, 72, 98.
Platy-, Greek for broad, in compounds, such as *Platyphyllous*, broad-leaved, &c.
Pleio-, Greek for full or abounding, used in compounds, such as *Pleiopetalous*, of many petals, &c.
Plumbeus, lead-colored.
Plumose, feathery; when any slender body (such as a bristle of a pappus or a style) is beset with hairs along its sides, like the plume of a feather.
Plumule, the bud or first shoot of a germinating plantlet above the cotyledons, 13
Pluri-, in composition, many or several; as *Plurifoliolate*, with several leaflets.
Pod, specially a legume, 122; also may be applied to any sort of capsule.
Podium, a footstalk or stipe, used only in Greek compounds, as (suffixed) *Leptopodus*, slender-stalked, or (prefixed) *Podocephalus*, with a stalked head, and in *Podosperm*, a seed stalk or funiculus.
Pogon, Greek for beard, comes into various compounds.

Pointless, destitute of any pointed tip, such as a *mucro*, *awn*, *acumination*, &c.
Pollen, the fertilizing powder contained in the anther, 14, 80, 103.
Pollen-growth, 117. *Polleniferous*, pollen-bearing.
Pollen-mass, *Pollinium*, the united mass of pollen, 104, as in Milkweed and Orchis.
Pollicaris, Latin for an inch long.
Pollination, the application of pollen to the stigma, 114.
Poly-, in compound words of Greek origin, same as *multi-* in those of Latin origin, viz. many, as
Polyadelphous, stamens united by their filaments into several bundles, 100.
Polyandrous, with numerous stamens (inserted on the receptacle), 100.
Polycarpic, term used by DeCandolle in the sense of perennial.
Polycotyledonous, having many (more than two) cotyledons, as Pines, 23.
Polygamous, having some perfect and some unisexual flowers, 85.
Polygonal, many-angled.
Polygynous, with many pistils or styles, 105.
Polymerous, formed of many parts of each set.
Polymorphous, of several or varying forms.
Polypetalous, when the petals are distinct or separate (whether few or many), 89.
Polyphyllous, many-leaved; formed of several distinct pieces.
Polysepalous, same as the last when applied to the calyx, 89.
Polyspermous, many-seeded.
Pome, the apple, pear, and similar fleshy fruits, 119.
Pomiferous, pome-bearing.
Porrect, outstretched.
Posterior side or portion of a flower (when axillary) is that toward the axis, 96.
Pouch, the silicle or short pod, as of Shepherd's Purse, 123.
Præcocious (Latin, *præcox*), unusually early in development.
Præfloration, same as *æstivation*, 97.
Præfoliation, same as *vernation*, 71.
Præmorse, ending abruptly, as if bitten off.
Pratensis, Latin for growing in meadows.
Prickles, sharp elevations of the bark, coming off with it, as of the Rose.
Prickly, bearing prickles, or sharp projections like them.
Primine, the outer coat of the covering of the ovule, 110.
Primordial, earliest formed; primordial leaves are the first after the cotyledons.
Prismatic, prism-shaped; having three or more angles bounding flat sides.
Procerous, tall, or tall and slim.
Process, any projection from the surface or edge of a body.
Procumbent, trailing on the ground, 39.
Procurrent, running through but not projecting.
Produced, extended or projecting; the upper sepal of a Larkspur is *produced* above into a spur, 87.
Proliferous (literally, bearing offspring), where a new branch rises from an older one, or one head or cluster of flowers out of another.
Propaculum or *Propagulum*, a shoot for propagation.
Prosenchyma, a tissue of wood-cells.
Prostrate, lying flat on the ground, 39.
Protandrous or *Proterandrous*, the anthers first maturing, 116.
Proteranthous, flowering before leafing.
Proterogynous or *Protogynous*, the stigmas first to mature, 116.
Prothallium or *Prothallus*, 160.
Protoplasm, the soft nitrogenous lining or contents, or living part, of cells, 129.
Protos, Greek for first; in various compounds.
Pruinose, *Pruinate*, frosted; covered with a powder like hoar-frost.
Pseudo-, Greek for false. *Pseudo-bulb*, the aerial corms of epiphytic Orchids, &c.
Psilos, Greek for bare or naked, used in many compounds.
Pteridophyta, *Pteridophytes*, 156.
Pteris, Greek for wing, and general name for Fern, enters into many compounds.

Puberulent, covered with fine and short or almost imperceptible down.
Pubescent, hairy or downy, especially with fine and soft hairs or *pubescence*.
Pulverulent or *Pulveraceous*, as if dusted with fine powder.
Pulvinate, cushioned, or shaped like a cushion.
Pumilus, low or little.
Punctate, dotted, either with minute holes or what look as such.
Puncticulate, minutely punctate.
Pungent, prickly-tipped.
Puniceous, carmine-red.
Purpureus, originally red or crimson, more used for duller or bluish-red.
Pusillus, weak and small, tiny.
Putamen, the stone of a drupe, or the shell of a nut, 120.
Pygmæus, Latin for dwarf.
Pyramidal, shaped like a pyramid.
Pyrene, *Pyrena*, a seed-like nutlet or stone of a small drupe.
Pyriform, pear-shaped.
Pyxidate, furnished with a lid.
Pyxis, *Pyxidium*, a pod opening round horizontally by a lid, 124.

Quadri-, in words of Latin origin, four; as *Quadrangular*, four-angled; *Quadrifoliate*, four-leaved; *Quadrifid*, four-cleft. *Quaternate* in fours.
Quinate, in fives. *Quinque*, five.
Quincuncial, in a quincunx; when the parts in æstivation are five, two of them outside, two inside, and one half out and half in.
Quintuple, five-fold.

Race, a marked variety which may be perpetuated from seed, 176.
Raceme, a flower-cluster, with one-flowered pedicels arranged along the sides of a general peduncle, 73.
Racemose, bearing racemes, or raceme-like.
Racnis, see *rhachis*.
Radial, belonging to the ray.
Radiate, or *Radiant*, furnished with ray-flowers, 94.
Radiate-veined, 52.
Radical, belonging to the root, or apparently coming from the root.
Radicant, rooting, taking root on or above the ground.
Radicels, little roots or rootlets.
Radicle, the stem part of the embryo, the lower end of which forms the root, 11, 127
Rameal, belonging to a branch. *Ramose*, full of branches (*rami*).
Ramentaceous, beset with thin chaffy scales (*Ramenta*), as the stalks of many Ferns
Ramification, branching, 27.
Ramulose, full of branchlets (*ramuli*).
Raphe, see *rhaphe*.
Ray, parts diverging from a centre, the marginal flowers of a head (as of Coreopsis, 94), or cluster, as of Hydrangea (78), when different from the rest, especially when ligulate and diverging (like rays or sunbeams); also the branches of an umbel, 74.
Ray-flowers, 94.
Receptacle, the axis or support of a flower, 81, 112; also the common axis or support of a head of flowers, 73.
Reclined, turned or curved downwards; nearly recumbent.
Rectinerved, with straight nerves or veins.
Recurved, curved outwards or backwards.
Reduplicate (in æstivation), valvate with the margins turned outwards, 97
Reflexed, bent outwards or backwards.
Refracted, bent suddenly, so as to appear broken at the bend
Regular, all the parts similar in shape, 82.
Reniform, kidney-shaped, 53.

Repand, wavy-margined, 55.
Repent, creeping, i. e. prostrate and rooting underneath.
Replum, the frame of some pods (as of Prickly Poppy and Cress), persistent after the valves fall away.
Reptant, same as repent.
Resupinate, inverted, or appearing as if upside down, or reversed.
Reticulated, the veins forming network, 50. *Retiform*, in network.
Retinerved, reticulate-veined.
Retroflexed, bent backwards; same as *reflexed*.
Retuse, blunted; the apex not only obtuse but somewhat indented, 54.
Revolute, rolled backwards, as the margins of many leaves, 72.
Rhachis (the backbone), the axis of a spike or other body, 73.
Rhaphe, the continuation of the seed-stalk along the side of an anatropous ovule or seed, 112, 126.
Rhaphides, crystals, especially needle-shaped ones, in the tissues of plants, 137.
Rhizanthous, flowering from the root.
Rhizoma, *Rhizome*, a rootstock, 42–44.
Rhombic, in the shape of a rhomb. *Rhomboidal*, approaching that shape.
Rib, the principal piece, or one of the principal pieces of the framework of a leaf, or any similar elevated line along a body, 49, 50.
Rimose, having chinks or cracks.
Ring, an elastic band on the spore-cases of Ferns, 159.
Ringent, grinning; gaping open, 92.
Riparious, on river-banks.
Rivalis, Latin for growing along brooks; or *Rivularis*, in rivulets.
Root, 33.
Root-hairs, 35.
Rootlets, small roots, or root-branches, 33.
Rootstock, root-like trunks or portions of stems on or under ground, 42.
Roridus, dewy.
Rosaceous, arranged like the petals of a rose.
Rostellate, bearing a small beak (*Rostellum*).
Rostrate, bearing a beak (*Rostrum*) or a prolonged appendage.
Rosulate, in a rosette or cluster of spreading leaves.
Rotate, wheel-shaped, 89.
Rotund, rounded or roundish in outline.
Ruber, Latin for red in general. *Rubescent*, *Rubicund*, reddish or blushing.
Rudimentary, imperfectly developed, or in an early state of development.
Rufous, *Rufescent*, brownish-red or reddish-brown.
Rugose, wrinkled; roughened with wrinkles.
Ruminated (albumen), penetrated with irregular channels or portions, as a nutmeg, looking as if chewed.
Runcinate, coarsely saw-toothed or cut, the pointed teeth turned towards the base of the leaf, as the leaf of a Dandelion.
Runner, a slender and prostrate branch, rooting at the end, or at the joints, 40.

Sabulose, growing in sand.
Sac, any closed membrane, or a deep purse-shaped cavity.
Saccate, sac-shaped.
Sagittate, arrowhead-shaped, 53.
Salsuginous, growing in brackish soil.
Salver-shaped, or *Salver-form*, with a border spreading at right angles to a slender tube, 89.
Samara, a wing-fruit, or key, 122.
Samaroid, like a samara or key-fruit.
Sap, the juices of plants generally, 136. *Sapwood*, 142.
Saprophytes, 37.
Sarcocarp, the fleshy part of a stone-fruit, 120.

Sarmentaceous, *Sarmentose*, bearing long and flexible twigs (*Sarments*), either spreading or procumbent.
Saw-toothed, see *serrate*, 55.
Scabrous, rough or harsh to the touch.
Scalariform, with cross-bands, resembling the steps of a ladder, 134.
Scales, of buds, 28; of bulbs, &c., 46.
Scalloped, same as *crenate*, 55.
Scaly, furnished with scales, or scale-like in texture.
Scandent, climbing, 39.
Scape, a peduncle rising from the ground or near it, as in many Violets.
Scapiform, scape-like.
Scapigerous, scape-bearing.
Scar of the seed, 126. *Leaf-scars*, 27, 28.
Scarious or *Scariose*, thin, dry, and membranous.
Scion, a shoot or slip used for grafting.
Scleros, Greek for hard, hence *Sclerocarpous*, hard-fruited.
Scobiform, resembling sawdust.
Scorpioid or *Scorpioidal*, curved or circinate at the end, 77.
Scrobiculate, pitted; excavated into shallow pits.
Scurf, *Scurfiness*, minute scales on the surface of many leaves, as of Goosefoot.
Scutate, *Scutiform*, buckler-shaped.
Scutellate, or *Scutelliform*, saucer-shaped or platter-shaped.
Secund, one-sided; i. e. where flowers, leaves, &c., are all turned to one side.
Secundine, the inner coat of the ovule, 110.
Seed, 125. *Seed-leaves*, see *cotyledons*. *Seed-vessel*, 127.
Segment, a subdivision or lobe of any cleft body.
Segregate, separated from each other.
Semi-, in compound words of Latin origin, half; as
Semi-adherent, as the calyx or ovary of Purslane; *Semicordate*, half-heart-shaped *Semilunar*, like a half-moon; *Semiovate*, half-ovate, &c.
Seminal, relating to the seed (*Semen*). *Seminiferous*, seed-bearing.
Sempervirent, evergreen.
Sensitiveness in plants, 149, 152.
Senary, in sixes.
Sepal, a leaf or division of the calyx, 14, 79.
Sepaloid, sepal-like. *Sepaline*, relating to the sepals.
Separated Flowers, those having stamens or pistils only, 85.
Septate, divided by partitions.
Septenate, with parts in sevens.
Septicidal, where dehiscence is through the partitions, 123.
Septiferous, bearing the partition.
Septifragal, where the valves in dehiscence break away from the partitions, 123
Septum (plural *septa*), a partition or dissepiment.
Serial, or *Seriate*, in rows; as *biserial*, in two rows, &c.
Sericeous, silky; clothed with satiny pubescence.
Serotinous, late in the season.
Serrate, the margin cut into teeth (*Serratures*) pointing forwards, 55.
Serrulate, same as the last, but with fine teeth.
Sessile, sitting; without any stalk.
Sesqui-, Latin for one and a half; so *Sesquipedalis*, a foot and a half long.
Seta, a bristle, or a slender body or appendage resembling a bristle.
Setaceous, bristle-like. *Setiform*, bristle-shaped.
Setigerous, bearing bristles. *Setose*, beset with bristles or bristly hairs.
Setula, a diminutive bristle. *Setulose*, provided with such.
Sex, six. *Sexangular*, six-angled. *Sexfarious*, six-faced.
Sheath, the base of such leaves as those of Grasses, which are
Sheathing, wrapped round the stem.
Shield-shaped, same as *scutate*, or as *peltate*, 53.

Shrub, Shrubby, 39.
Sieve-cells, 140.
Sigmoid, curved in two directions, like the letter S, or the Greek *sigma*.
Silicle, a pouch, or short pod of the Cress Family, 123.
Siliculose, bearing a silicle, or a fruit resembling it.
Silique, capsule of the Cress Family, 123.
Siliquose, bearing siliques or pods which resemble siliques.
Silky, glossy with a coat of fine and soft, close-pressed, straight hairs.
Silver-grain, the medullary rays of wood, 139.
Silvery, shining white or bluish-gray, usually from a silky pubescence.
Simple, of one piece; opposed to *compound*.
Sinistrorse, turned to the left.
Sinuate, with margin alternately bowed inwards and outwards, 55.
Sinus, a recess or bay; the re-entering angle between two lobes or projections.
Sleep of Plants (so called), 151.
Smooth, properly speaking not rough, but often used for glabrous, i. e. not pubescent.
Soboliferous, bearing shoots (*Soboles*) from near the ground.
Solitary, single; not associated with others.
Sordid, dull or dirty in hue.
Sorediate, bearing patches on the surface.
Sorosis, name of a multiple fruit, like a pine-apple.
Sorus, a fruit-dot of Ferns, 159.
Spadiceous, chestnut-colored. Also spadix-bearing.
Spadix, a fleshy spike of flowers, 75.
Span, the distance between the tip of the thumb and of little finger outstretched, six or seven inches.
Spathaceous, resembling or furnished with a
Spathe, a bract which inwraps an inflorescence, 75.
Spatulate, or *Spathulate*, shaped like a spatula, 52.
Species, 175.
Specific Names, 179.
Specimens, 184.
Spermaphore, or *Spermophore*, one of the names of the placenta.
Spermum, Latin form of Greek word for seed; much used in composition.
Spica, Latin for spike; hence *Spicate*, in a spike, *Spiciform*, in shape resembling a spike.
Spike, an inflorescence like a raceme, only the flowers are sessile, 74.
Spikelet, a small or a secondary spike; the inflorescence of Grasses.
Spine, 41, 64.
Spindle-shaped, tapering to each end, like a radish, 36.
Spinescent, tipped by or degenerating into a thorn.
Spinose, or *Spiniferous*, thorny.
Spiral Vessels or *ducts*, 135.
Spithameous, span-high.
Spora, Greek name for seed, used in compound words.
Sporadic, widely dispersed.
Sporangium, a spore-case in Ferns, &c., 158.
Spore, a body resulting from the fructification of Cryptogamous plants, in them the analogue of a seed.
Spore-case (*Sporangium*), 158.
Sporocarp, 162.
Sport, a newly appeared variation, 176.
Sporule, same as a spore, or a small spore.
Spumescent, appearing like froth.
Spur, any projecting appendage of the flower, looking like a spur but hollow, as that of Larkspur, fig. 239.
Squamate, *Squamose*, or *Squamaceous*, furnished with scales (*squamæ*).

Squamellate, or *Squamulose*, furnished with little scales (*Squamellæ*, or *Squamulæ*).
Squamiform, shaped like a scale.
Squarrose, where scales, leaves, or any appendages spread widely from the axis on which they are thickly set.
Squarrulose, diminutive of *squarrose*; slightly squarrose.
Stachys, Greek for spike.
Stalk, the stem, petiole, peduncle, &c., as the case may be.
Stamen, 14, 80, 98.
Staminate, furnished with stamens, 86. *Staminal*, relating to the stamens.
Staminodium, an abortive stamen, or other body in place of a stamen.
Standard, the upper petal of a papilionaceous corolla, 92.
Starch, 136, 163.
Station, the particular kind of situation in which a plant naturally occurs.
Stellate, *Stellular*, starry or star-like; where several similar parts spread out from a common centre, like a star.
Stem, 39. *Stemlet*, diminutive stem.
Stemless, destitute or apparently destitute of stem.
Stenos, Greek for narrow; hence *Stenophyllous*, narrow-leaved, &c.
Sterile, barren or imperfect.
Stigma, the part of the pistil which receives the pollen, 14, 80, 105.
Stigmatic, or *Stigmatose*, belonging to the stigma.
Stipe (Latin *Stipes*), the stalk of a pistil, &c., when it has any, 112; also of a Fern, 158, and of a Mushroom, 172.
Stipel, a stipule of a leaflet, as of the Bean, &c.
Stipellate, furnished with stipels, as in the Bean tribe.
Stipitate, furnished with a stipe.
Stipulaceous, belonging to stipules. *Stipulate*, furnished with stipules.
Stipules, the appendages one each side of the base of certain leaves, 66.
Stirps (plural, *stirpes*), Latin for race.
Stock, used for race or source. Also for any root-like base from which the herb grows up.
Stole, or *Stolon*, a trailing or reclined and rooting shoot, 40.
Stoloniferous, producing stolons.
Stomate (Latin *Stoma*, plural *Stomata*), the breathing-pores of leaves, 144.
Stone-fruit, 119.
Storage-leaves, 62.
Stramineous, straw-like, or straw-colored.
Strap-shaped, long, flat, and narrow.
Striate, or *Striated*, marked with slender longitudinal grooves or stripes.
Strict, close and narrow; straight and narrow.
Strigillose, *Strigose*, beset with stout and appressed, stiff or rigid bristles.
Strobilaceous, relating to or resembling a strobile.
Strobile, a multiple fruit in the form of a cone or head, 124.
Strombuliform, twisted, like a spiral shell.
Strophiole, same as *caruncle*, 126. *Strophiolate*, furnished with a strophiole.
Struma, a wen; a swelling or protuberance of any organ.
Strumose, bearing a struma.
Stupose, like tow.
Style, a stalk between ovary and stigma, 14, 80, 105.
Styliferous, *Stylose*, bearing styles or conspicuous ones.
Stylopodium, an epigynous disk, or an enlargement at the base of the style.
Sub-, as a prefix, about, nearly, somewhat; as *Subcordate*, slightly cordate; *Subserrate*, slightly serrate; *Subaxillary*, just beneath the axil, &c.
Subclass, *Suborder*, *Subtribe*, 178.
Suberose, corky or cork-like in texture.
Subulate, awl-shaped; tapering from a broadish or thickish base to a sharp point.
Succise, as if cut off at lower end.
Succubous, when crowded leaves are each covered by base of next above.

Suckers, shoots from subterranean branches, 39.
Suffrutescent, slightly shrubby or woody at the base only, 39.
Suffruticose, rather more than suffrutescent, 37, 39.
Sulcate, grooved longitudinally with deep furrows.
Superior, above, 96; sometimes equivalent to posterior, 96.
Supernumerary Buds, 30, 31.
Supervolute, plaited and convolute in bud, 97.
Supine, lying flat, with face upward.
Supra-axillary, borne above the axil, as some buds, 31.
Supra-decompound, many times compounded or divided.
Surculose, producing suckers (*Surculi*) or shoots resembling them.
Suspended, hanging down. Suspended ovules or seeds hang from the very summit of the cell which contains them.
Sutural, belonging or relating to a suture.
Suture, the line of junction of contiguous parts grown together, 106.
Sword-shaped, applied to narrow leaves, with acute parallel edges, tapering above.
Syconium, the fig-fruit, 124.
Sylvestrine, growing in woods.
Symmetrical Flower, similar in the number of parts of each set, 82.
Sympetalous, same as gamopetalous.
Sympode, *Sympodium*, a stem composed of a series of superposed branches in such a way as to imitate a simple axis, as in Grape-vine.
Synantherous or *Syngenesious*, where stamens are united by their anthers, 100.
Syncarpous (fruit or pistil), composed of several carpels consolidated into one.
Synonym, an equivalent superseded name.
Synsepalous, same as gamosepalous.
System (artificial and natural), 182, 183.
Systematic Botany, the study of plants after their kinds, 9.

Tabescent, wasting or shrivelling.
Tail, any long and slender prolongation of an organ.
Taper-pointed, same as acuminate, 54.
Tap-root, a root with a stout tapering body, 32–35.
Tawny, dull yellowish, with a tinge of brown.
Taxonomy, the part of botany which treats of classification.
Tegmen, a name for the inner seed-coat.
Tendril, a thread-shaped organ used for climbing, 40.
Terete, long and round; same as *cylindrical*, only it may taper.
Terminal, borne at, or belonging to, the extremity or summit.
Terminology treats of technical terms; same as *Glossology*, 181.
Ternate, *Ternately*, in threes.
Tessellate, in checker-work.
Testa, the outer (and usually the harder) coat or shell of the seed, 125.
Testaceous, the color of unglazed pottery.
Tetra- (in words of Greek composition), four; as, *Tetracoccous*, of four cocci.
Tetradynamous, where a flower has six stamens, two shorter than the four, 101.
Tetragonal, four-angled. *Tetragynous*, with four pistils or styles. *Tetramerous* with its parts or sets in fours. *Tetrandrous*, with four stamens, 100.
Tetraspore, a quadruple spore, 169.
Thalamaflorous, with petals and stamens inserted on the torus or *Thalamus*.
Thallophyta, *Thallophytes*, 165.
Thallus, a stratum, in place of stem and leaves, 165.
Theca, a case; the cells or lobes of the anther.
Thecaphore, the stipe of a carpel, 113.
Thorn, an indurated pointed branch, 41, 42.
Thread-shaped, slender and round or roundish, like a thread.
Throat, the opening or gorge of a monopetalous corolla, &c., where the border and the tube join, and a little below, 89.

Thyrse or *Thyrsus*, a compact and pyramidal panicle of cymes or cymules, 79.
Tomentose, clothed with matted woolly hairs (*tomentum*).
Tongue-shaped, long and flat, but thickish and blunt.
Toothed, furnished with teeth or short projections of any sort on the margin; used especially when these are sharp, like saw-teeth, and do not point forwards, 55.
Top-shaped, shaped like a top, or a cone with apex downwards.
Torose, *Torulose*, knobby; where a cylindrical body is swollen at intervals.
Torus, the receptacle of the flower, 81, 112.
Trachea, a spiral duct.
Trachys, Greek for rough; used in compounds, as, *Trachyspermous*, rough-seeded.
Transverse, across, standing right and left instead of fore and aft.
Tri- (in composition), three; as,
Triadelphous, stamens united by their filaments into three bundles, 99.
Triandrous, where the flower has three stamens, 112.
Tribe, 178.
Trichome, of the nature of hair or pubescence.
Trichotomous, three-forked. *Tricoccous*, of three cocci or roundish carpels.
Tricolor, having three colors. *Tricostate*, having three ribs.
Tricuspidate, three-pointed. *Tridentate*, three-toothed.
Triennial, lasting for three years.
Trifarious, in three vertical rows; looking three ways.
Trifid, three-cleft, 56.
Trifoliate, three-leaved. *Trifoliolate*, of three leaflets.
Trifurcate, three-forked. *Trigonous*, three-angled, or triangular.
Trigynous, with three pistils or styles, 116. *Trijugate*, in three pairs (*jugi*).
Trilobed or *Trilobate*, three-lobed, 55.
Trilocular, three-celled, as the pistils or pods in fig. 328–330.
Trimerous, with its parts in threes. *Trimorphism*, 117. *Trimorphic* or *Trimorphous*, in three forms.
Trinervate, three-nerved, or with three slender ribs.
Triœcious, where there are three sorts of flowers on the same or different individuals, as in Red Maple. A form of Polygamous.
Tripartible, separable into three pieces. *Tripartite*, three-parted, 55.
Tripetalous, having three petals.
Triphyllous, three-leaved; composed of three pieces.
Tripinnate, thrice pinnate, 59. *Tripinnatifid*, thrice pinnately cleft, 57.
Triple-ribbed, *Triple-nerved*, &c., where a midrib branches into three, near the base of the leaf.
Triquetrous, sharply three-angled; and especially with the sides concave, like a bayonet.
Triserial, or *Triseriate*, in three rows, under each other.
Tristichous, in three longitudinal or perpendicular ranks.
Tristigmatic, or *Tristigmatose*, having three stigmas.
Trisulcate, three-grooved.
Triternate, three times ternate, 59.
Trivial Name, the specific name.
Trochlear, pulley-shaped.
Trumpet-shaped, tubular; enlarged at or towards the summit.
Truncate, as if cut off at the top.
Trunk, the main stem or general body of a stem or tree.
Tube (of corolla, &c.), 89.
Tuber, a thickened portion of a subterranean stem or branch, provided with eyes (buds) on the sides, 44.
Tubercle, a small excrescence.
Tubercled, or *Tuberculate*, bearing excrescences or pimples.
Tubæform, trumpet-shaped.
Tuberous, resembling a tuber. *Tuberiferous*, bearing tubers.
Tubular, hollow and of an elongated form; hollowed like a pipe, 91.

Tubuliflorous, bearing only tubular flowers.
Tunicate, coated; invested with layers, as an onion, 46.
Turbinate, top-shaped.
Turio (plural *turiones*), strong young shoots or suckers springing out of the ground, as Asparagus-shoots.
Turnip-shaped, broader than high, abruptly narrowed below, 35.
Twining, ascending by coiling round a support, 39.
Type, the ideal pattern, 10.
Typical, well exemplifying the characteristics of a species, genus, &c.

Uliginose, growing in swamps.
Umbel, the umbrella-like form of inflorescence, 74.
Umbellate, in umbels. *Umbelliferous*, bearing umbels.
Umbellet (*umbellula*), a secondary or partial umbel, 76.
Umbilicate, depressed in the centre, like the ends of an apple; with a navel.
Umbonate, bossed; furnished with a low, rounded projection like a boss (*umbo*).
Umbraculiform, umbrella-shaped.
Unarmed, destitute of spines, prickles, and the like.
Uncial, an inch (*uncia*) in length.
Uncinate, or *Uncate*, hook-shaped; hooked over at the end.
Under-shrub, partially shrubby, or a very low shrub.
Undulate, or *Undate*, wavy, or wavy-margined, 55.
Unequally pinnate, pinnate with an odd number of leaflets, 65.
Unguiculate, furnished with a claw (*unguis*), 91.
Uni-, in compound words, one; as *Unicellular*, one-celled.
Uniflorous, one-flowered. *Unifoliate*, one-leaved.
Unifoliolate, of one leaflet, 59. *Unijugate*, of one pair.
Unilabiate, one-lipped. *Unilateral*, one-sided.
Unilocular, one-celled. *Uniovulate*, having only one ovule.
Uniserial, in one horizontal row.
Unisexual, having stamens or pistils only, 85.
Univalved, a pod of only one piece after dehiscence.
Unsymmetrical Flowers, 86.
Urceolate, urn-shaped.
Utricle, a small thin-walled, one-seeded fruit, as of Goosefoot, 121.
Utricular, like a small bladder.

Vaginate, sheathed, surrounded by a sheath (*vagina*).
Valve, one of the pieces (or doors) into which a dehiscent pod, or any similar body splits, 122, 123.
Valvate, *Valvular*, opening by valves. *Valvate*, in æstivation, 97.
Variety, 176.
Vascular, containing vessels, or consisting of vessels or ducts, 134.
Vascular Cryptogams, 156.
Vaulted, arched; same as *fornicate*.
Vegetable Life, &c., 128. *Vegetable anatomy*, 129.
Veins, the small ribs or branches of the framework of leaves, &c., 49, 50.
Veined, *Veiny*, furnished with evident veins. *Veinless*, destitute of veins.
Veinlets, the smaller ramifications of veins, 50.
Velate, furnished with a veil.
Velutinous, velvety to the touch.
Venation, the veining of leaves, &c., 50.
Venenate, poisonous.
Venose, veiny; furnished with conspicuous veins.
Ventral, belonging to that side of a simple pistil, or other organ, which looks towards the axis or centre of the flower; the opposite of dorsal; as the *Ventral Suture*, 106.
Ventricose, inflated or swelled out on one side.

Venulose, furnished with veinlets.
Vermicular, worm-like, shaped like worms.
Vernal, belonging to spring.
Vernation, the arrangement of the leaves in the bud, 71.
Vernicose, the surface appearing as if varnished.
Verrucose, warty; beset with little projections like warts.
Versatile, attached by one point, so that it may swing to and fro, 101.
Vertex, same as *apex*.
Vertical, upright, perpendicular to the horizon, lengthwise.
Verticil, a whorl, 68. *Verticillate*, whorled, 68.
Verticillaster, a false whorl, formed of a pair of opposite cymes.
Vesicular, bladdery.
Vespertine, appearing or expanding at evening.
Vessels, ducts, &c., 134.
Vexillary, *Vexillar*, relating to the
Vexillum, the standard of a papilionaceous flower, 92.
Villose, shaggy with long and soft hairs (*Villosity*).
Vimineous, producing slender twigs, such as those used for wicker-work.
Vine, in the American use, any trailing or climbing stem; as a Grape-vine
Virescent, *Viridescent*, greenish; turning green.
Virgate, wand-shape; as a long, straight, and slender twig.
Viscous, *Viscid*, having a glutinous surface.
Vitta (plural *vittæ*), the oil-tubes of the fruit of Umbelliferæ.
Vitelline, yellow, of the hue of yolk of egg.
Viviparous, sprouting or germinating while attached to the parent plant.
Voluble, twining; as the stem of Hops and Beans, 39.
Volute, rolled up in any way.

Wavy, the surface or margin alternately convex and concave, 55.
Waxy, resembling beeswax in texture or appearance.
Wedge-shaped, broad above, tapering by straight lines to a narrow base, 53.
Wheel-shaped, 89.
Whorl, an arrangement of leaves, &c., in circles around the stem.
Whorled, arranged in whorls, 68.
Wing, any membranous expansion. *Wings* of papilionaceous flowers, 92.
Winged, furnished with a wing; as the fruit of Ash and Elm, fig. 300, 301.
Wood, 133, 142. *Woody*, of the texture or consisting of wood.
Woody Fibre, or *Wood-Cells*, 134.
Woolly, clothed with long and entangled soft hairs.
Work in plants, 149, 155.

Xanthos, Greek for yellow, used in compounds; as *Xanthocarpus*, yellow-fruited.

Zygomorphous, said of a flower which can be bisected only in one plane into similar halves.

FIELD, FOREST, AND GARDEN BOTANY

FIELD, FOREST, AND GARDEN

BOTANY

A SIMPLE INTRODUCTION TO THE COMMON PLANTS OF THE UNITED STATES EAST OF THE 100TH MERIDIAN, BOTH WILD AND CULTIVATED

BY

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REVISED AND EXTENDED BY

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W. P. 17

PREFACE TO THE FIRST EDITION.

This book is intended to furnish botanical classes and beginners generally with an easier introduction to the plants of this country than the *Manual*, and one which includes the common cultivated as well as the native species. It is made more concise and simple, first, by the use of somewhat less technical language; second, by the omission, as far as possible, of the more recondite and, for the present purpose, less essential characters; and also of most of the obscure, insignificant, or rare plants which students will not be apt to meet with or to examine, or which are quite too difficult for beginners; such as the Sedges, most Grasses, and the crowd of Golden Rods, Asters, Sunflowers, and the like, which require very critical study. On the other hand, this small volume is more comprehensive than the *Manual*, since it comprises the common herbs, shrubs, and trees of the Southern as well as the Northern and Middle States, and all which are commonly cultivated or planted, for ornament or use, in fields, gardens, pleasure grounds, or in house culture, including even the conservatory plants ordinarily met with.

It is very desirable that students should be able to use exotic as well as indigenous plants in analysis; and a scientific acquaintance with the plants and flowers most common around us in garden, field, and greenhouse, and which so largely contribute to our well-being and enjoyment, would seem to be no less important than in the case of our native plants. If it is worth while so largely to assemble around us ornamental and useful trees, plants, and flowers, it is certainly well to know what they are and what they are like. To students in agricultural schools and colleges this kind of knowledge will be especially important.

One of the main objects of this book is to provide cultivators, gardeners, and amateurs, and all who are fond of plants and flowers, with a simple guide to a knowledge of their botanical names and

structure. There is, I believe, no sufficient work of this kind in the English language, adapted to our needs, and available even to our botanists and botanical teachers — for whom the only resource is to a botanical library beyond the reach and means of most of these, and certainly quite beyond the reach of those whose needs I have here endeavored to supply, so far as I could, in this small volume. The great difficulties of the undertaking have been to keep the book within the proper compass, by a rigid exclusion of all extraneous and unnecessary matter, and to determine what plants, both native and exotic, are common enough to demand a place in it, or so uncommon that they may be omitted. It is very unlikely that I can have chosen wisely in all cases and for all parts of the country, and in view of the different requirements of botanical students on the one hand and of practical cultivators on the other — the latter commonly caring more for made varieties, races and crosses, than for species, which are the main objects of botanical study.

But I have here brought together, within less than 350 pages, brief and plain botanical descriptions or notices of 2650 species, belonging to 947 genera; and have constructed keys to the natural families, and analyses of their contents, which I hope may enable students, who have well studied the *First Lessons*, to find out the name, main characters, and place of any of them which they will patiently examine in blossom, and, when practicable, in fruit also. If the book answers its purpose reasonably well, its shortcomings as regards cultivated plants may be made up hereafter. As to the native plants omitted, they are to be found, and may best be studied, in the *Manual of the Botany of the Northern United States*, and in Chapman's *Flora of the Southern United States*.

This book is designed to be the companion of the *First Lessons in Botany*, which serves as grammar and dictionary; and the two may be bound together into one compact volume, forming a comprehensive *School Botany*.

For the account of the Ferns, and the allied families of Cryptogamous Plants I have to record my indebtedness to Professor D. C. Eaton of Yale College. These beautiful plants are now much cultivated by amateurs; and the means here so fully provided for studying them will doubtless be appreciated.

HARVARD UNIVERSITY HERBARIUM, Cambridge, Mass.,
August 29, 1868.

PREFACE TO THE REVISION.

THREE motives have dominated the course of this revision; First, to preserve, so far as possible, the method of the original; it is still Asa Gray's botany, and the reviser has attempted nothing more than to bring it down to date. Second, it is a companion to the *Manual*, and, therefore, the nomenclature is made to conform strictly with that volume; and the authorities have been added for the purpose of identifying the names, and to distinguish them from other systems of nomenclature which are now advocated. Third, it is primarily a school book, and there has been no attempt to include either all the wild or all the cultivated plants of its territory, but rather to consider those species which are most readily accessible for demonstration, and which are most likely to attract the attention of a beginner in botany. If it is said that many conspicuous wild plants are omitted, the reviser will answer that all such plants are described in the *Manual*, and Chapman's *Flora of the Southern States*, while there is no other account of our domesticated flora. Therefore, in cases of doubt as to the relative importance, to this volume, of wild and cultivated species, the cultivated rather than the native plants have been inserted.

A preliminary draft of this revision, through the family Leguminosæ, was made by Professor Charles R. Barnes, of the University of Wisconsin, of which I have been glad to avail myself.

L. H. BAILEY.

CORNELL UNIVERSITY, Ithaca, New York,
January, 1895.

Cuts in *Leavitt's Outlines of Botany* which correspond to the cuts in *Gray's Lessons* referred to in this Flora.

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CXXXVII. Equisetaceæ (Horsetail Family) 486
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AN ANALYTICAL KEY TO THE NATURAL FAMILIES.

A. FLOWERING OR PHÆNOGAMOUS. *Plants producing true flowers and seeds.* (B, page 25.)

I. ANGIOSPERMS, *those plants bearing the ovules in a closed ovary; cotyledons normally 2 or 1 (includes all but the Pine and Cycad families).* (II, page 24.)

\+ DICOTYLEDONS OR EXOGENS, *with wood in a circle or in concentric annual circles or layers around a central pith; netted-veined leaves; and parts of the flower mostly in fives or fours. Cotyledons typically 2.* (++ page 23.)

O. *Polypetalous Division, typically with both calyx and corolla, the latter of wholly separate petals.* (OO, page 17. OOO, page 21.)

* *More than 10 stamens, more than twice the number of the sepals or divisions of the calyx.* (* * page 15.)

PAGE

Stamens monadelphous, united with the base of the corolla: anthers kidney-shaped, one-celled . . . . MALLOW FAMILY, 85

Stamens monadelphous at base: anthers two-celled: leaves twice pinnate . . . . . MIMOSA SUBF. 122

Stamens monadelphous at base: anthers two-celled: leaves not pinnate —

Leaves with joint between petiole and blade, which is translucent-dotted . . . . . (Citrus) RUE F. 98

Leaves without a joint and not translucent-dotted CAMELLIA F. 84

Stamens not monadelphous —

Pistils numerous, but imbricated over each other and cohering in a mass on a long receptacle . . . . MAGNOLIA F. 45

Pistils several, immersed in hollows in a top-shaped receptacle, (Nelumbo) WATER LILY F. 51

Pistils numerous and separate, at least their ovaries, but concealed in a hollow fleshy receptacle —

Which bears sepals or bracts over its surface: leaves simple, opposite . . . . . CALYCANTHUS F. 163

Which is naked and imitates an inferior ovary: leaves alternate, compound . . . . . (Rosa) ROSE F. 141

Pistils numerous or more than one, separate, on the receptacle —

Stamens borne on the calyx . . . . . ROSE F. 141

Stamens borne on the receptacle —

Leaves centrally peltate: aquatic herb (Brasenia), WATER LILY F. 51

Leaves peltate near the margin: woody climber, MOONSEED F. 48

Leaves not peltate, quite entire: trees or shrubs —

Spicy anise-scented: petals numerous: seed solitary, (Illicium) MAGNOLIA F. 45

Unpleasantly scented when bruised: petals 6 in 2 ranks: seeds several . . . CUSTARD APPLE F. 48

Leaves not peltate: herbs, or if woody-stemmed the leaves are compound . . . . . CROWFOOT F. 34

Pistils (as to ovary) one below but 3-several-lobed or horned at the top— PAGE
Not fleshy plants: petals unequal, cut or cleft: pod 1-celled, many-seeded . . . . . MIGNONETTE F. 68
Not fleshy: pod several-celled, several-seeded, (Nigella) CROWFOOT F. 34
Fleshy plants: petals equal, narrow, entire FIG MARIGOLD F. 199
Pistil one, completely so as to the ovary, which is—
One-celled, and with one parietal placenta, or otherwise showing that the pistil is of a single carpel—
Shrubs or trees: leaves twice pinnate or else phyllodia: fruit a pod . . . . . (Acacia) PULSE F. 116
Shrubs or trees: leaves simple: stone fruit (Prunus) ROSE F. 141
Herbs; with 1-flowered 1–2-leaved stems: leaves peltate, (Podophyllum) BARBERRY F. 49
Herbs; with flowers in racemes, &c.: leaves not peltate, CROWFOOT F. 34
One-celled, with two or more parietal placentæ—
Calyx free from the ovary: stamens on the receptacle—
Leaves punctate with pellucid and dark dots, opposite, entire . . . . . ST. JOHN'S-WORT F. 81
Leaves not punctate—
Calyx persistent, of 5 unequal sepals ROCKROSE F. 69
Calyx deciduous, of 4 sepals: petals 4, (Polanisia) CAPER F. 68
Calyx falling when the corolla opens or before: petals more numerous than the (mostly 2) sepals . . . . . POPPY F. 54
Calyx coherent with the ovary—
Fleshy and leafless, often prickly plants CACTUS F. 195
Leafy herbs, rough or bristly, the hairs sometimes stinging . . . . . LOASA F. 187
Two–several-celled, or when 1-celled the ovules not parietal—
Leaves punctate with both dark and pellucid dots, opposite: ovary superior . . . . ST. JOHN'S-WORT F. 81
Leaves punctate with pellucid dots, not jointed with their stalk: ovary inferior . . . . . MYRTLE F. 175
Leaves punctate with pellucid dots, alternate, jointed with their stalk: ovary superior . . . . . RUE F. 98
Leaves not punctate with pellucid dots, and—
All at the root, in the form of pitchers or tubes, PITCHER PLANT F. 53
All at the root, bearing a flytrap at the end, SUNDEW F. 173
All from prostrate rootstocks or tubers under water, mostly peltate or rounded, equal-sided, WATER LILY F. 51
On the rootstock or tuber, or alternate on stems, unequal-sided, succulent: flowers monœcious BEGONIA F. 193
On herbaceous stems, succulent: pod 1-celled, PURSLANE F. 79
On woody stems (trees or shrubs), of ordinary conformation—
Stamens on the receptacle, mostly in 5 clusters: calyx valvate in the bud: stipules (often deciduous), LINDEN F. 91
Stamens in 5 clusters, one on the base of each petal: calyx imbricated in the bud: no stipules—
Ovary superior, 5-celled . CAMELLIA F. 84
Ovary partly inferior, becoming one-celled and one-seeded . . . . STORAX F. 277
Stamens separate: leaves alternate, mostly with stipules . . . . . PEAR SUBF. 143
Stamens separate: leaves opposite or some of them scattered: no stipules—
Calyx tube or cup wholly adherent to the 3–5-celled ovary . . SAXIFRAGE F. 164
Calyx cup extended beyond the free or adherent few–many-celled ovary LOOSESTRIFE F. 177

* * *Not more than* 10 *stamens, or if so not more than twice the number of the sepals or divisions of the calyx.* PAGE

+ *Calyx free from the two or more separate or nearly separate ovaries.*

Woody twiners, with dicœcious flowers, separate stamens opposite as many petals, and few pistils . . . MOONSEED F. 48

Woody twiners, with monœcious flowers, united stamens, and many pistils in a head, in fruit scattered in a spike MAGNOLIA F. 45

Trees, with dicœcious or polygamous flowers, pinnate leaves, and few winged fruits . . . . . QUASSIA F. 101

Trees, with dicœcious flowers, or herbs with perfect flowers: leaves pinnate, pellucid-dotted, strong-scented or aromatic RUE F. 98

Herbs or shrubs: leaves not pellucid-dotted: flowers chiefly perfect —

Succulent or fleshy plants: pistils, petals, and sepals all equal in number . . . . . ORPINE F. 170

Not succulent nor fleshy thickened —

Stamens inserted on the calyx: leaves alternate, ROSE F. 141, & SAXIFRAGE F. 164

Stamens inserted on a disk adhering to bottom of the calyx: leaves opposite, compound, (Staphylea) SOAPBERRY F. 108

Stamens inserted on the receptacle . . CROWFOOT F. 34

++ *Calyx free from the single (simple or compound) ovary; i.e. ovary superior.*

Stamens of the same number as the petals and opposite them —

Anthers opening by uplifted valves: ovary simple, 1-celled, BARBERRY F. 49

Anthers opening lengthwise —

Ovary 1-celled, 1-ovuled: styles 5 . . LEADWORT F. 271

Ovary 1-celled, with several ovules on a central placenta —

Style and stigma only one: calyx persistent, PRIMROSE F. 273

Style or stigma cleft or lobed . . PURSLANE F. 79

Ovary 5-celled, with several ovules in each cell, STERCULIA F. 90

Ovary 2-celled, with a pair of erect ovules in each cell, VINE F. 106

Ovary 2–4-celled, with one erect ovule in each cell, BUCKTHORN F. 104

Stamens when of the same number as the petals alternate with them, sometimes more numerous, sometimes fewer —

Leaves punctate with pellucid and dark dots, opposite, entire: calyx persistent . . . ST. JOHN'S-WORT F. 81

Leaves punctate with large pellucid dots: leaves alternate or compound . . . . . RUE F. 98

Leaves not punctate with pellucid dots —

Ovary simple, as shown by the style, stigma, and single parietal placenta . . . . . PULSE F. 116

Ovary seemingly simple, 1-celled, 1-seeded: style 1, (Fumaria) FUMITORY F. 57

Ovary compound, as shown by the number of cells, placentæ, styles, or stigmas —

With 2 parietal placentæ, but 2-celled by a partition between: stamens tetradynamous MUSTARD F. 58

With 2 parietal placentæ, and 1-celled: stamens 6, separate, not tetradynamous . . . CAPER F. 68

With 2 parietal placentæ, and 1-celled: stamens 6 in 2 sets, FUMITORY F. 57

With 3 (*rarely* 5) *parietal placentæ, and* 1-*celled: stamens not* 6 —

Stamens inserted on the calyx, or with 5 clusters of gland-tipped stamen-like bodies, SAXIFRAGE F. 164

Stamens on the long stalk of the ovary: tendril climbers . . PASSION-FLOWER F. 189

Stamens on the receptacle —

Flower irregular: style 1 . . VIOLET F. 71

Flower regular: styles various—

PAGE

Styles or their divisions twice as many as the placentæ: leaves glandular-bristly, SUNDEW F. 173

Styles as many as the placentæ: leaves awl-shaped or scale-shaped, TAMARISK F. 81

Style and stigma one: stamens 5: leaves coriaceous . PITTOSPORUM F. 69

Style and stigma one, or sessile stigmas 3: stamens not 5 . ROCKROSE F. 69

With one cell, one erect ovule, and 3 styles or stigmas, CASHEW F. 112

With one cell and many ovules on a central placenta, PINK F. 73

With two cells and several or many ovules in the center, but becoming 1-celled: stamens 4–12, on the calyx, LOOSESTRIFE F. 177

With two cells and a single hanging ovule in each cell—

Flowers irregular: stamens 6 or 8, diadelphous or monadelphous: anthers opening at the apex, POLYGALA F. 114

Flowers regular, with narrow petals: shrubs or trees—

With alternate simple leaves and 4 stamens with anthers . WITCH-HAZEL F. 174

With opposite leaves and 2 (rarely 3 or 4) stamens, OLIVE F. 279

With more than two cells, or when only two cells with 2 or more ovules in each cell—

Seeds very numerous in each of the 3–5 cells of the pod: style 1: stamens on the receptacle, HEATH F. 262

Seeds numerous, or few on a stalk bursting out of the pod: style 1: stamens on the calyx, LOOSESTRIFE F. 177

Seeds indefinitely numerous: styles 2 or more, or splitting into 2: stamens on the calyx, SAXIFRAGE F. 164

Seeds several or few, at least the ovules 3–12 in each cell—

Shrubs, with opposite leaves of 3 or 5 leaflets, and a bladdery pod BLADDERNUT SUBF. 109

Herbs, with alternate or radical leaves of 3 or more leaflets: flower regular, (Oxalis) GERANIUM F. 93

Herbs, with simple alternate leaves: flower irregular (Impatiens) GERANIUM F. 93

Shrubs, with simple leaves: seeds in a pulpy aril, STAFF TREE F. 103

Seeds and ovules only one or two in each cell—

Tree, with twice pinnate leaves, and anthers within the tube of united filaments, MELIA F. 101

Shrubs or herbs, with stamens monadelphous only at base, and aromatic-scented leaves, GERANIUM F. 93

Herbs, with alternate leaves, mostly of pungent taste and odor, no tendrils when climbing: stamens separate . . GERANIUM F. 93

Herbs, with alternate and compound insipid leaves, climbing by a hook or tendril in the flower cluster, (Cardiospermum) SOAPBERRY F. 108

Herbs (or one species shrubby), with simple and entire scentless leaves, and stamens often slightly monadelphous at the base, FLAX F. 92

Shrubs or trees, leaves not aromatic-scented: stamens separate — PAGE

Leaves simple, not lobed: fruit a small berry, HOLLY F. 102

Leaves simple, not lobed: fruit a colored pod: seeds in a red pulpy aril, STAFF TREE F. 103

Leaves simple, palmately-lobed or cleft, opposite . . . MAPLE SUBF. 109

Leaves compound, pinnate or digitate, SOAPBERRY F. 108

+++ *Calyx with tube adherent to the ovary, i.e. ovary inferior.*

Tendril-bearing herbs, with mostly monœcious or diœcious flowers: stamens commonly only 3 . . . . . GOURD F. 190

Not tendril-bearing —

Pod many-seeded, 4-celled: anthers 1-celled, opening by a pore: leaves 3–5 ribbed . . . . . MELASTOMA F. 176

Pod or berry many-seeded: anthers 2-celled, opening lengthwise —

Styles 2–5, or one and 2-cleft . . . SAXIFRAGE F. 164

Style 1: stigma 2–4 lobed or entire, EVENING PRIMROSE F. 179

Pod with 1–4 seeds, and ovary with more than one ovule in each cell, the seed inclosed in a pulpy aril. . STAFF-TREE F. 103

Fruit with one seed, and ovary with only one ovule in each cell —

Stamens just as many as the petals, and opposite them, BUCKTHORN F. 104

Stamens as many as the petals and alternate with them, or sometimes twice as many —

Style only one, slender: stigma notched or 4-lobed: calyx with its tube mostly prolonged more or less beyond the ovary: herbs . EVENING PRIMROSE F. 179

Style only one, thick: stigmas 5: calyx not at all continued beyond the ovary . . GINSENG F. 204

Style and stigma one: trees or shrubs, or if herbs the head of flowers with corolla-like involucre, DOGWOOD F. 205

Style none: sessile stigmas 4: aquatic herbs, WATER MILFOIL F. 175

Styles 2–5 —

Petals 4: styles 2: flowers in axillary clusters in late autumn: shrub: pod 2-lobed, WITCH-HAZEL F. 174

Petals 5: styles 2–5: flowers corymbed: shrub or trees . . . . . PEAR SUBF. 143

Petals 5: styles 2–5, mostly 5: flowers umbelled: fruit berry-like . . . GINSENG F. 204

Petals 5: styles 2: flowers in (mostly compound) umbels: fruit dry, splitting into 2 closed pieces . . . . . PARSLEY F. 200

OO *Monopetalous Division, typically with both calyx and corolla, the latter united more or less into one piece.*

* *Calyx with its tube adherent to the ovary, i.e. superior, or ovary inferior.*

Flowers collected in a head which is provided with a calyx-like involucre: anthers syngenesious, i.e. united into a tube or ring around the style, only 4 or 5 . . . . . COMPOSITE F. 220

Flowers not involucrate, or when in an involucrate head having the anthers separate —

Tendril-bearing herbs: leaves alternate: flowers usually monœcious or diœcious . . . . . GOURD F. 190

Not tendril-bearing: flowers commonly perfect, at most polygamous —

Stamens free from the corolla, or lightly cohering with its base —

Flowers irregular: stamens with the 5 anthers and sometimes the filaments also united . . LOBELIA F. 260

Flowers regular: herbs, with some milky juice: stamens only as many as the lobes of the corolla CAMPANULA F. 261

Flowers regular: shrubs, or evergreen and trailing: stamens twice as many as lobes of corolla, WHORTLEBERRY SUBF. 262

Stamens borne on the tube of the corolla and fewer than its lobes, viz. — PAGE

One to three: ovary sometimes 3-celled, but the fruit only 1-celled and 1-seeded . . . VALERIAN F. 218

Four, two of them shorter: ovary 3-celled, but two cells empty: fruit 1-seeded (Linnæa) HONEYSUCKLE F. 208

Four, one longer and one shorter pair: ovary 1-celled: fruit very many-seeded . . . . GESNERIA F. 334

Stamens borne on the corolla, twice or more than twice the number of its lobes, more or less monadelphous or 5-adelphous: leaves alternate . . . . . STORAX F. 277

Stamens borne on the tube of the corolla, just as many as its lobes: leaves opposite, whorled, crowded, or radical —

With stipules entire . . . . . MADDER F. 214

Without true stipules —

Ovary 1-celled, 1-seeded: flowers in an involucrate head, TEASEL F. 219

Ovary 2–5-celled —

2-celled, the fruit twin: leaves entire, in whorls, MADDER F. 214

2–5-celled: flowers not in a proper head; leaves chiefly opposite, often toothed or compound, HONEYSUCKLE F. 208

3-celled: leaves mossy-crowded, or radical, DIAPENSIA F. 271

* * *Calyx free from the ovary, i.e. inferior, or ovary superior* —

+ *Corolla more or less irregular* —

Stamens 10 or 5, distinct: anthers opening by a hole at the apex of each cell: ovary 5-celled . . . . . HEATH F. 262

Stamens 10, diadelphous or monadelphous: anthers opening lengthwise: ovary 1-celled . . . . . PULSE F. 116

Stamens 8 or 6, diadelphous or monadelphous: anthers opening by a hole at the apex: ovary 2-celled . . . . POLYGALA F. 114

Stamens 6, diadelphous: the middle anther of each set 2-celled, the other two 1-celled: ovary 1-celled . . FUMITORY F. 57

Stamens (with anthers) 5 —

Ovary deeply 4-lobed, making 4 seed-like fruits or pieces, (Echium, etc.) BORAGE F. 301

Ovary not divided: fruit (mostly a pod) many-seeded —

Calyx urn-shaped, inclosing the pod, which is 2-celled, the top separating as a lid, (Hyoscyamus) NIGHTSHADE F. 311

Calyx 5-cleft or 5-parted: pod 2-valved, (Verbascum) FIGWORT F. 318

Stamens (with anthers) 4 *or* 2 —

Ovary 1-celled with a central placenta, bearing several or many seeds: stamens 2 . . . . . BLADDERWORT F. 333

Ovary 1-celled with 2 or 4 parietal placentæ: stamens 4, didynamous —

Leafless plants, brownish or yellowish, never green, with scales in place of foliage . . . BROOM RAPE F. 332

Leafy plants, with ordinary foliage —

Not climbing: seeds minute, wingless GESNERIA F. 334

Climbing: seeds winged . . . . BIGNONIA F. 335

Ovary 2-celled, many-ovuled: pod containing very many flat and winged seeds: woody climbers or trees BIGNONIA F. 335

Ovary 4-celled (but stigmas only 2): many flat and wingless large seeds, filled by the embryo: herbs . . SESAMUM F. 337

Ovary 2-celled, many-seeded or few-seeded, the placenta in the axis —

Seeds few or several in each cell, flat and borne on hook-like projections of the placentæ, or globular on a cartilaginous ring: no albumen . . . . ACANTHUS F. 337

Seeds many or few in each cell, not borne on hooks, &c.: embryo in albumen —

Corolla 2-lipped or very irregular, FIGWORT F. 318 (Also SCHIZANTHUS, 318)

Corolla regular or very nearly so . NIGHTSHADE F. 311

Ovary 2–4 celled, rarely 1-celled, with only a single ovule or seed in each cell, not lobed . . . . . VERVAIN F. 339
Ovary 4-parted, making 4 seed-like pieces or nutlets around the single style . . . . . MINT F. 342
++ *Corolla regular.*
Stamens more numerous than the divisions of the corolla. (Here, from the cohesion of the bases of the petals, some of the following, ranked as polypetalous, may be sought) —
Leaves twice pinnate, or else phyllodia: ovary one, simple, 1-celled . . . . . MIMOSA SUBF. 122
Leaves simply compound, of 3 leaflets: ovary 5-celled: stamens 10, monadelphous at the base (Oxalis) GERANIUM F. 93
Leaves simple, in one compound, fleshy, very thick: anthers 2-celled: pistils as many as lobes of the corolla ORPINE F. 170
Leaves simple or lobed or divided: stamens indefinite, monadelphous: anthers kidney-shaped, 1-celled . MALLOW F. 85
Leaves simple, not lobed or divided, nor fleshy: anthers 2-celled: pistil compound, more than 1-celled —
Anthers commonly opening at the end: stamens on the receptacle, free or nearly free from the corolla, HEATH F. 262
Anthers opening lengthwise: stamens on the corolla or mainly so: trees or shrubs —
Flowers polygamous or dicœcious: stamens separate: styles 4, each 2-lobed . . . EBONY F. 277
Flowers perfect: stamens more or less monadelphous or 5-clustered —
Base of the calyx coherent with the base of the ovary, STORAX F. 277
Calyx wholly free from the ovary CAMELLIA F. 84
Stamens fewer than the lobes or divisions of the corolla —
Four, mostly didynamous —
Ovary 2-celled, with usually many ovules in each cell, FIGWORT F. 318
Ovary 2-celled, with few or several ovules in each cell: seeds flat on hooks . . . ACANTHUS F. 337
Ovary 2–4-celled, with a single ovule in each cell, VERVAIN F. 339
Two only with anthers, and two abortive ones: ovary deeply 4-lobed . . . . . (Lycopus) MINT F. 342
Two, exserted: herbs, or some exotic species are low shrubby plants . . . . (Veronica) FIGWORT F. 318
Two or three: shrubs, trees, or woody twiners OLIVE F. 279
Stamens (with anthers) as many as the lobes or divisions of the corolla and opposite them —
Styles or stigmas 5: ovary 1-celled: ovule and seed solitary, LEADWORT F. 271
Style and stigma only one —
Herbs: ovary 1-celled with a central placenta: seeds few or many . . . . . PRIMROSE F. 273
Trees or shrubs: ovary 5-celled: fruit 1-few-seeded: petal-like scales alternate with the anthers SAPODILLA F. 276
Stamens (with anthers) as many as the lobes or parts of the corolla and alternate with them —
Pistil one and simple, with one parietal placenta: fruit a legume or loment: leaves twice pinnate . . MIMOSA SUBF. 122
Pistils as many as the lobes of the corolla, separate: fleshy plants, ORPINE F. 170
Pistils several or many as to the ovary, or ovaries deeply lobed, the lobes or pieces making so many separate little 1-seeded fruits or akenes, but all around one common style —
Akenes or lobes numerous in a heap or several in a circle, (Nolana) CONVOLVULUS F. 306
Akenes or lobes only 4 around the base of the common style —
Aromatic plants, with opposite leaves, (Mentha, etc.) MINT F. 342
Not aromatic, with alternate and commonly rough leaves, BORAGE F. 301

Pistils 2 *as to their ovaries, these making many-seeded pods, but stigmas and often styles also united into one*— PAGE

Pollen powdery and loose, as in ordinary plants, not in masses . . . . . DOGBANE F. 283

Pollen all in waxy or granular masses, usually 10, and fixed in pairs to 5 glands of the stigma . MILKWEED F. 286

Pistil one, with a single compound ovary which is not divided nor deeply lobed—

Stamens on the receptacle, or lightly cohering above with what seems to be the corolla: ovary 1-celled, 1-seeded, (Mirabilis) FOUR-O'CLOCK F. 358

Stamens on the receptacle, or nearly so: ovary 5-celled: pod many-seeded . . . . . HEATH F. 262

Stamens borne on very base of the 4–8-parted corolla: the cells of the ovary just as many, one ovule in each: no style: berry-like fruit containing as many little stones, HOLLY F. 102

Stamens plainly borne on the corolla—

Leaves all radical, 1–7-ribbed: flowers in a spike: corolla thin and becoming dry: stamens 4: style and stigma one: pod 2-celled, rarely 3-celled, opening transversely . . . . . PLANTAIN F. 356

Leaves on the stem—

All opposite and entire, their bases or petioles connected by small stipules or a transverse stipular line: ovary and pod 2-celled, several-seeded, LOGANIA F. 290

All opposite or whorled and entire, without stipules: ovary and pod 1-celled, several-many-seeded: placentæ parietal—

Juice milky: leaves short-petioled, (Allamanda) DOGBANE F. 283

Juice not milky, bitter: stem leaves sessile, GENTIAN F. 291

Alternate or some opposite, without stipules: ovary and pod 1-celled with 2 parietal placentæ—

Smooth marsh or water plants: leaves round-heart-shaped, entire, or of 3 entire leaflets, GENTIAN F. 291

More or less hairy plants: leaves mostly toothed or divided: style 2-cleft, WATERLEAF F. 298

Opposite, no stipules: ovary 4-celled, 4-ovuled: stamens 4: style not 3-cleft, VERVAIN F. 339

Opposite or alternate, simple or compound, without stipules, not twining: ovary and pod 3-celled: stamens 5: style 3-cleft at the apex, POLEMONIUM F. 295

Alternate, pinnate and tendril-bearing, lowest leaflets imitating leafy stipules, (Cobæa) POLEMONIUM F. 295

Alternate, at least not opposite, without stipules: stamens 5, *rarely* 4: *ovary* 2–5-*celled*—

Four cells of the ovary 1-ovuled: fruit splitting into little nutlets: flower-clusters coiled, (Heliotrope) BORAGE F. 301

Two or three 2-ovuled or four 1-ovuled cells: seeds large: mostly twiners, CONVOLVULUS F. 306

Two or rarely more many-ovuled cells: seeds numerous—

Styles 2, or rarely 3, or 2-cleft, WATERLEAF F. 298

Style and stigma only one, NIGHTSHADE F. 311

Leaves none: leafless parasitic twiners, destitute of green herbage . . . . DODDER SUBF. 730

OOO *Apetalous Division, with only one series of true floral envelopes (corolla absent), or no envelopes.* PAGE

* *Flowers not in catkins.* (* * bottom page 22.)

Ovary 2–6-celled, its cells containing numerous ovules —

Six-celled, the tube of the calyx coherent with its surface or the lower part of it: lobes of the calyx 3 . BIRTHWORT F. 372

Four-celled, the tube of calyx coherent with its surface: lobes of calyx and stamens 4 (Ludwigia) EVENING PRIMROSE F. 179

Five-celled, five-horned, free from the calyx: stamens 10, (Penthorum) ORPINE F. 170

Three-celled, free from the calyx of 5 sepals white inside: stamens 3 . . . (Mollugo) FIG MARIGOLD F. 199

Two-celled or four-celled, free from but inclosed in the cup-shaped calyx: stamens 4, (Rotala Ammannia) LOOSESTRIFE F. 177

Two-celled, many pistils in a head: no calyx: flowers monœcious. Tree . . (Liquidambar) WITCH-HAZEL F. 174

Ovary 1–2-celled, several-ovuled on one side of a basal placenta, (Cuphea) LOOSESTRIFE F. 177

Ovary or ovaries 1-celled, with numerous or several ovules, on parietal placentæ; calyx free —

Calyx of 2 sepals: placentæ 2 . . (Bocconia) POPPY F. 53

Calyx of 3 sepals: ovules scattered. (Akebia) BARBERRY F. 49

Calyx of 4 or more sepals: placenta 1 . . CROWFOOT F. 34

Ovary 1-celled, with several or many ovules from the bottom or on a central placenta, free from the calyx —

Flowers surrounded by dry scarious or colored bracts —

Pod opening transversely above the base AMARANTH F. 360

Pod splitting from the top . . . KNOTWORT F. 359

Flowers not surrounded by dry or colored bracts —

Stamens inserted at the base of the ovary, CHICKWEED SUBF. 73

Stamens inserted on the calyx . . KNOTWORT F. 359

Ovary or separate (or separable) ovaries 1-celled, with one or sometimes two or three ovules —

Woody plants, parasitic on trees, diœcious . MISTLETOE F. 378

Woody or partly woody climbers by their leafstalks, (Clematis) CROWFOOT F. 34

Trees or shrubs, not climbing —

Leaves pinnate, aromatic, their stalks mostly prickly: pistils more than one . . (Xanthoxylum) RUE F. 98

Leaves pinnate, not aromatic nor prickly: pistil one, (Fraxinus) OLIVE F. 279

Leaves simple, beset with silvery (rarely coppery) scurf or scurfy down . . . . . OLEASTER F. 377

Leaves simple, not silvery-scurfy —

Aromatic or spicy-tasted: calyx mostly corolla-like: anthers opening by uplifted valves LAUREL F. 375

Aromatic-scented: no proper calyx: anthers not opening by valves . . . . SWEET GALE F. 392

Not aromatic: juice milky: stipules deciduous: flowers in a closed receptacle, which becomes pulpy, (Fig) FIG SUBF. 385

Not aromatic, and juice not milky: the leaves —

Palmately lobed and veined, with sheathing stipules: no evident calyx . . PLANE TREE F. 389

Mostly toothed, feather-veined, sometimes also with ribs from the base: calyx free from the ovary, ELM SUBF. 384

Entire: calyx corolla-like and free from the ovary: flowers perfect . . . MEZEREUM F. 376

Entire (rarely toothed): tube of calyx coherent with ovary: flowers diœciously polygamous —

Ovary and fruit pear-shaped: stigma terminal, SANDALWOOD F. 378

Ovary globular or oval: stigma running down one side of the awl-shaped style, (Nyssa) DOGWOOD F. 205

PAGE

Herbs, with sheathing stipules above the tumid joints of the stem: leaves alternate . . . . BUCKWHEAT F. 367

Herbs, with the stipules (if any) not in the form of sheaths —

Pistils numerous or several: calyx commonly corolla-like: stipules none . . . . . CROWFOOT F. 34

Pistils 3 or 4: calyx and corolla none: flowers perfect, in a spike . . . . . PEPPER F. 374

Pistils 1–4, inclosed by the persistent calyx: leaves alternate, pinnate or lobed, with stipules, (Poterium, etc.) ROSE F. 141

Pistil 1, with 2 hairy styles or stigmas: leaves palmately compound or cleft: flowers dicœcious. HEMP SUBF. 385

Pistil only one: leaves simple —

Calyx corolla-like (white), its tube coherent with the ovary: flowers perfect: leaves alternate, SANDALWOOD F. 378

Calyx corolla-like, free from the ovary, but the base of its tube hardening and persistent as a covering to the thin akene, making a sort of nut-like fruit: style and stigma simple . FOUR-O'CLOCK F. 358

Calyx greenish, sometimes colored or corolla-like: seed solitary —

Style or stigma one and simple: flowers monœcious or dicœcious . . . . . NETTLE F. 384

Styles or stigmas 2 or 3, or 2–3-cleft: flowers mostly perfect —

Flowers crowded with dry and scarious bracts, AMARANTH F. 360

Flowers without imbricated and scarious bracts —

Leaves chiefly alternate, often toothed, cleft, or lobed . . . GOOSEFOOT F. 363

Leaves opposite, entire, CHICKWEED SUBF. 73

Calyx none, except as an adherent covering to the ovary, without lobes: aquatic . WATER MILFOIL F. 175

Calyx none, the flowers in catkin-like spikes, (Piper, etc.) PEPPER F. 374

Ovary 2–10-celled, with one or two ovules in each cell —

Aquatic herbs, with 3–4-celled nut-like little fruits in the axils of the leaves or bracts . . . . WATER MILFOIL F. 175

Herbs, shrubs, rarely trees, with monœcious flowers, 3-celled ovary and 3-lobed pod: the ovules and seeds single or a pair hanging from the summit of the cell: juice milky, except in the Box, etc. . . . . SPURGE F. 379

Herbs, with stout hollow stems, perfect flowers, and 10-celled ovary, becoming berry-like . . . POKEWEED F. 367

Shrubs or trees, with 2-celled ovary, and winged fruit (samara or key) —

Of two keys, joined at their base and winged from the apex, MAPLE SUBF. 109

Of a single key, winged from the apex or almost all round: leaves pinnate . . . . (Fraxinus) OLIVE F. 279

Of a single key, thin-winged all round: leaves simple, ELM SUBF. 384

Shrubs or trees with wingless 2–9-celled fruit, no milky juice, and —

Perfect or sometimes dicœcious flowers: stamens 4–9 —

Ovule hanging . . . . . HOLLY F. 102

Ovule erect . . . . . BUCKTHORN F. 104

Perfect flowers: stamens about 24, white: seeds hanging, (Fothergilla) WITCH-HAZEL F. 174

* * *Flowers (all monœcious or dicœcious) one or both sorts in catkins or catkin-like heads.*

Twining herb, with sterile flowers panicled, and fertile in a short scaly catkin (strobile) . . . (Humulus) NETTLE F. 384

Climbing and woody, or low herbs, with mostly perfect flowers in slender spikes . . . . . PEPPER F. 374

Parasitic shrub, on trees: fruit a berry . . MISTLETOE F. 378

Trees or shrubs— PAGE

With resinous juice, needle-shaped or scale-like leaves, and a cone (strobile) for fruit . . . . . PINE F. 476

With milky or colored juice, sterile flowers in spikes or racemes and fertile in catkin-like heads or short spikes, forming a fleshy mass in fruit, inclosing the akenes, FIG SUBF. 385

With colorless juice, often strong-scented resinous-aromatic bark, pinnate leaves, and only sterile flowers in catkins, WALNUT F. 390

With colorless juice and simple leaves—

Both kinds of flowers in short catkins or heads: fruit waxy-coated, berry-like or nut-like: leaves aromatic, SWEET GALE F. 392

Both kinds of flowers in scaly catkins: the fertile with 2 or 3 flowers, forming winged or sometimes wingless akenes or small keys, under each scale or bract, (Betula, Alnus) OAK F. 392

Both kinds of flowers in catkins, dicœcious, one under each scale or bract: pod filled with downy-tufted seeds, WILLOW F. 399

Both kinds of flowers in heads, monœcious, without calyx: leaves palmately-lobed—

Fruit of many two-beaked hard pods in a head: stipules deciduous . . . . WITCH-HAZEL F. 174

Fruit a head of club-shaped hairy-based nutlets: stipules sheathing . . . . PLANE TREE F. 389

Both kinds of flowers or commonly only the sterile in catkins: fruit a nut in a scaly cup, or bur, or sac, or leafy-bracted involucre . . . . . OAK F. 392

++Monocotyledons or Endogens, *with wood in separate threads scattered through the diameter of the stem, not in a circle, no annual circles or layers; leaves mostly parallel-veined; and parts of the flower almost always in threes, never in fives; cotyledon* 1.

O *Petaloideous Division, with flowers not on a spadix, and perianth or part of it more or less corolla-like.*

Pistils more than one, mostly numerous, separate or nearly so: perianth of 3 green sepals and 3 colored petals: leaves mostly netted-veined between the ribs . WATER PLANTAIN F. 454

Pistil only one as to the ovary—

Perianth adherent to the ovary, or superior, i.e. ovary inferior—

Flowers dicœcious: stem twining: leaves with distinct petiole and blade, the veins or veinlets netted . . YAM F. 430

Flowers dicœcious or polygamous: aquatic herbs: flowers from a spathe . . . . . FROGBIT F. 402

Flowers perfect—

Anthers only one or two, borne on or united with the style or stigma: flower irregular . ORCHIS F. 403

Anther only one, embracing the slender style but not united with it, 2-celled: flower irregular, GINGER SUBF. 410

Anther only one, free from the style, 1-celled: flower irregular . . . . ARROWROOT SUBF. 410

Anthers 5 (one abortive filament without any anther): flower somewhat irregular . . BANANA F. 410

Anthers 3, turned outwards: filaments either separate or monadelphous . . . . . IRIS F. 415

Anthers 3, fixed by the middle: flower woolly outside, (Lachnanthes) BLOODWORT F. 414

Anthers 6, *all the stamens being perfect*—

Epiphytes or air plants, except the Pineapple, PINEAPPLE F. 414

Terrestrial plants, chiefly from bulbs or corms, some from tubers, fibrous roots, or rootstalks—

Perianth woolly or much roughened outside, BLOODWORT F. 414

Perianth not woolly or roughened without, AMARYLLIS F. 424

Perianth free from the ovary or very nearly so — PAGE
Epiphytes or air plants, with dry and often scurfy leaves, (Tillandsia) PINEAPPLE F. 414
Stout aquatic herbs: flowers irregular as to the (corolla-like) perianth or stamens, or both, PICKEREL WEED F. 452
Moss-like aquatic herb, with regular flowers . MAYACA F. 456
Terrestrial herbs or sometimes woody plants, not rush-like or grass-like —
Perianth of green sepals and colored petals which are distinctly different —
Styles or sessile stigmas 3, separate: petals 3, not ephemeral: leaves netted-veined, (Trillium) LILY F. 431
Style and stigma one: petals 3 or 2, ephemeral, SPIDERWORT F. 453
Perianth with all 6 (in one instance only 4) parts colored alike or nearly so —
Anthers 1-celled: plants mostly climbing by tendrils on the petiole . . . SMILAX SUBF. 431
Anthers 2-celled . . . . . LILY F. 431
Terrestrial or aquatic rush-like or grass-like plants, with small regular flowers —
Not in a simple scaly-bracted head: perianth glumaceous, ... RUSH F. 456
In a simple spike or raceme: flowers bractless, perfect: perianth herbaceous . WATER PLANTAIN F. 454
In a simple scaly-bracted head on a scape: leaves all from the root —
Perianth yellow, the inner divisions or petals with claws: flowers perfect: pod 1-celled, many seeded, the placentæ parietal, YELLOW-EYED GRASS F. 456
Perianth whitish: flowers monœcious or dicœcious: pod 2–3-celled, 2–3-seeded . PIPEWORT F. 456
OO *Spadiceous Division, with flowers on a spadix or fleshy spike, perianth none or not corolla-like, and no glumes.*
Trees or woody plants with simple trunk, caudex, or stock —
Leaves persistent, long-petioled, fan-shaped and plaited or pinnate: spadix branched: floral envelopes of 3 or 6 parts . PALM F. 463
Leaves undivided, long-linear and stiff . . . SCREW PINE F. 462
Immersed aquatics, branching and leafy . . . PONDWEED F. 457
Small or minute free-floating aquatics, with no distinction of stem and foliage . . . . . DUCKWEED F. 457
Reed-like or Flag-like marsh herbs, with linear and sessile nerved leaves —
Flowers naked in the spike: no distinct perianth CAT-TAIL F. 461
Flowers with a 6-parted perianth . . . (Acorus) ARUM F. 457
Terrestrial or marsh plants, with leaves of distinct blade and petiole, the veins netted . . . . . ARUM F. 457
OOO *Glumaceous Division, with flowers enveloped by glumes (chaffy bracts), and no manifest perianth.*
Ovary 3-celled or 1-celled with 3 parietal placentæ, becoming a pod, 3–many-seeded: flowers with a regular perianth of six glumaceous divisions. In structure of the flower most like the Lily Family; but the glumaceous perianth and the herbage imitate this division, RUSH F. 456
Ovary 1-celled, 1-ovuled, in fruit an akene or grain. True glumaceous plants; the glumes being bracts —
Glumes single, bearing a flower in the axil . . SEDGE F. 465
Glumes in pairs, an outer pair for the spikelet, an inner pair for each flower . . . . . GRASS F. 467
II. Gymnosperms, *without proper pistil, the ovules naked on a scale or on the end of a short axis: cotyledons often more than two in a whorl.*
With palm-like columnar trunks or corn-like stock, and pinnate palm-like foliage . . . . . CYCAD F. 485
With branching trunks, and simple, mostly needle-shaped, linear, or scale-like entire leaves . . . . . PINE F. 476

B. FLOWERLESS OR CRYPTOGAMOUS. *Plants not producing flowers, propagated by spores.* PAGE

With many-jointed stems and no leaves, except the united scales or teeth that form a sheath or ring at each joint: spore cases in a terminal head or spike . . . . . HORSETAIL F. 486

With ample leaves often compound, all from a rootstock or trunk, and bearing the minute spore cases—

Herbage circinate, or rolled up in the bud . . FERN F. 486

Herbage erect (not rolled up) as it unfolds, ADDER'S TONGUE FERN F. 501

With scale-shaped, linear, or awl-shaped and wholly simple leaves thickly set on the leafy stems: spore cases in the axil of some of them—

Spores all of one kind . . . . . CLUB MOSS F. 501

Spores of two unlike kinds . . . SELAGINELLA F. 503

APPARENT EXCEPTIONS TO THE CLASSIFICATORY SCHEME.

1. *Key to those exogens which from their foliage might perhaps be mistaken for endogens.*

Pistils indefinitely numerous: herbs, polypetalous, (Myosurus and some species of Ranunculus) CROWFOOT F. 34

Pistils 3–12, *separate* —

Leaves peltate or round heart-shaped: aquatic, polypetalous, WATER LILY F. 51

Leaves heart-shaped: marsh plants, apetalous, also destitute of calyx . . . . . PEPPER F. 374

Leaves thick and fleshy: polypetalous or some few monopetalous: flowers completely symmetrical . . ORPINE F. 170

Pistil one, but the ovary deeply 3–20-lobed or horned and style separate: leaves thick and fleshy: polypetalous, FIG MARIGOLD F. 199

Pistil one, the ovary 4-lobed, and sessile stigmas separate: leaves slender: aquatics . . . . . WATER MILFOIL F. 175

Pistil one: ovary not lobed: polypetalous —

Petals usually very numerous: ovary many-celled, many-seeded: aquatics . . . . . WATER LILY F. 51

Petals with the sepals usually very numerous: style 1: ovary 1-celled, many-ovuled: fleshy, leafless plants, CACTUS F. 195

Petals and styles, also the stamens 5: ovary 1-celled, 1-ovuled, LEADWORT F. 271

Petals 5: styles 2 or 3: ovary 1-celled, many-ovuled, free from the calyx: leaves opposite . (Dianthus, etc.) PINK F. 73

Petals 5: styles 2: ovary 2-celled, 2-ovuled: teeth of the calyx on its summit: leaves alternate, (Eryngium, etc.) PARSLEY F. 200

Petals 5 *or* 3*: style only one, not lobed* —

Calyx free from the 1-celled simple ovary: stamens numerous (Acacias with phyllodia) MIMOSA SUBF. 122

Calyx adherent to the several-celled ovary: stamens 8 or 10, MELASTOMA F. 176

Pistil only one, both as to ovary and style: monopetalous —

Stamens 5: style 3-cleft at the apex: pod 3-celled, POLEMONIUM F. 295

Stamens 4: style and stigma one: corolla 4-cleft, dry and scarious: pod 2-celled: leaves ribbed . . PLANTAIN F. 356

Stamens 8 or 10: style and stigma one: corolla becoming dry and scarious: leaves narrow . (Heaths) HEATH F. 262

Pistil, if it may be so called, an open scale, or none, GYMNOSPERMS, 476

2. *Key to those endogens which from their foliage might be mistaken for exogens.* PAGE

Flowers spiked on a spadix, and with a prominent spathe ARUM F. 457

Flowers not on a spadix: pistils several or many: calyx and corolla distinctly different . . . WATER PLANTAIN F. 454

Flowers not on a spadix: pistil only one —

Calyx coherent with the ovary: flowers dicecious or polygamous —

Terrestrial plants, twiners: small flowers in racemes, spikes, or panicles . . . . . YAM F. 430

Aquatic plants: flowers from a spathe . . FROGBIT F. 402

Calyx free from the ovary —

Aquatic herbs: flowers more or less irregular, from a sort of spathe . . . . . PICKEREL WEED F. 452

Terrestrial herbs, not climbing: anthers 2-celled (Trillium, etc.) LILY F. 431

Terrestrial and mostly twining shrubs or herbs, with tendrils on the petiole: anthers 1-celled . SMILAX SUBF. 431

SIGNS AND EXPLANATIONS.

The Signs and Abbreviations employed in this work are few. The signs are: —

① for an annual plant.
② for a biennial plant.
♃ for a perennial plant.

The signs for degrees, minutes, and seconds are used for feet, inches, and lines, the latter twelve to the inch. Thus 1° means a foot in length or height, &c.; 2′, two inches; 5′′, five lines, or five-twelfths of an inch.

The dash between two figures, as 5 – 10 means from five to ten, &c.

The character ∞ means *many*.

Fl. stands for flowers or flowering.
Cult. stands for cultivated.
Nat. stands for naturalized.
N., E., S., W. stand for North, East, South, and West.

The geographical abbreviations, such as Eu. for Europe, and the common abbreviations for the names of the States, need no particular explanation.

Species printed in **heavy-faced Roman type** are indigenous to some part of our territory (the U. S., East of the 100th meridian).

Those in ***heavy-faced Italic type*** are not indigenous to this territory, and they exist in our region only in cultivation or as introduced weeds.

The species and varieties in small capital Roman letters are horticultural forms or hybrids. When in parenthesis, they are simply synonyms.

Pronunciation. — In accordance with the usage in Gray's botanies, it is intended that the Latin names in this volume shall be pronounced after the English method. The accent marks designate both the accentuation (or most emphatic syllable), and the length of the vowel. The grave (`) designates a long vowel, and the acute (′) a short one. The letters *oi*, *like to*, representing the Greek ending *-οειδης*, should properly be pronounced separately. If the *i*, in this case, is the penultimate syllable (next to the last), it should be pronounced long, as in *prino-ìdes*, *usneoìdes*; but if it is the antepenultimate (third syllable from the end), it is pronounced short, as *rhombo-ĭdea*. In names derived from *dioïcus* and *monoïcus* (diœcious and monœcious), *òi* is a true diphthong, as in *choice*.

The diphthong *aù* is given its customary English sound. The pupil should bear in mind that the final *e* in the names of plants should always be pronounced (taking the sound of short *i*), as in *officinà-le*, *vulgà-re*, *commù-ne*.

STATISTICS OF THE REVISION.

Number of families	141	
Number of genera	1029	
Number of indigenous species		1784
Number of extra-limital species (or reputed species) . . .		1419
Total species		3203

Making a total gain over the first edition of 82 genera and 553 species.

NOMENCLATURE.

The first part of the name of a plant designates the genus to which it belongs, or is *generic;* the second part belongs to the particular species, or is *specific;* but both words are necessary for the designation of the plant or species. The literature of systematic botany is so voluminous, however, that, in order to identify the plant names and to aid in tracing them to their origins, it is necessary to cite the author of the name along with the name itself. In accordance with the method in Gray's botanies, this author is understood to be the one who first used the two names together; that is, he is the author of the complete name or combination and not necessarily of either part of it. The full names of the authors most frequently cited in this book are here given:

Adans. — Michel Adanson, 1727–1806. France.
A. DC. — Alphonse De Candolle, 1806–1893. Switzerland. (See DC.)
Ait. — William Aiton, 1731–1793. England.
Ait. f. — William Townsend Aiton, the son, 1766–1849. England.
All. — Carlo Allioni, 1725–1804. Italy.
Andr. — Henry C. Andrews, author of *The Botanist's Repository* at the opening of the century. England.
Arn. — George Arnold Walker Arnott, 1799–1868. Scotland.
Baker. — John Gilbert Baker, 1834– , keeper of the Herbarium of the Royal Gardens, Kew, England.
Bart. — William P. C. Barton, 1787–1856. Pennsylvania.
Bartr., Bartram. — William Bartram, 1739–1823. Pennsylvania.
Beauv. — Ambroise Marie François Joseph Palisot de Beauvois, 1755–1820. France.
Beck — Lewis C. Beck, 1798–1853. New York.
Benth. — George Bentham, 1800–1884. England.
Benth. & Hook. — Bentham (George) and Hooker (J. D.), authors of *Genera Plantarum.* England.
Bernh. — Johann Jacob Bernhardi, 1774–1850. Prussia.
Bieb. — Friedrich August Marschall von Bieberstein, 1768–1826. Germany.
Bigel. — Jacob Bigelow, 1787–1879. Massachusetts.
Blume — Karl Ludwig Blume, 1796–1862. Holland.
Boiss. — Edmond Boissier, 1810–1886. Switzerland.
Bojer — W. Bojer, 1800–1856, author of a Flora of Mauritius. Austria.
Britton — Nathaniel Lord Britton, Professor in Columbia College. New York.
Brong. — Adolphe Théodore Brongniart, 1801–1876. France.

Buckley — Samuel Botsford Buckley, 1809–1884. United States.
Bunge — Alexander von Bunge, 1803–1890. Russia.
Carr. — Élie Abel Carrière, a contemporaneous botanist and horticulturist. France.
Cass. — Alexandre Henri Gabriel Cassini, Comte de, 1781–1832. France.
Cav. — Antonio José Cavanilles, 1745–1804. Spain.
C. DC. — Casimir De Candolle, 1836– . Switzerland. (See DC.)
Cerv. — Vicente Cervantes, 1759(?)–1829. Mexico.
Cham. — Adalbert von Chamisso (poet and naturalist), 1781–1838. Germany.
Chapm. — Alvan Wentworth Chapman, a contemporaneous botanist of Florida, 1809– . Massachusetts.
Chois. — Jacques Denys Choisy, 1799–1859. Switzerland.
Curt. — William Curtis, 1746–1799. England.
Curtis. — Moses Ashley Curtis, 1808–1873. North Carolina.
DC. — Augustin Pyramus De Candolle, 1778–1841. Switzerland. Projector of the *Prodromus*, and head of a renowned family. Alphonse De Candolle, the son, and Casimir De Candolle, the grandson, are quoted in this book.
Decne. — Joseph Decaisne, 1809–1882. France.
Desf. — René Louiche Desfontaines, 1750–1833. France.
Desv. — Augustin Nicaise Desvaux, 1784–1856. France.
Don — George Don, 1798–1856. England.
D. Don — David Don, brother of George, 1800–1841. Scotland.
Donn — James Donn, author of *Hortus Cantabrigiensis*. England.
Douglas — David Douglas, 1799–1834; collector in N. W. America. Scotland.
Duchesne — Antoine Nicolas Duchesne, 1747–1827. France.
Dumort. — Barthélemy Charles Dumortier, 1797–1878. Belgium.
Dunal — Michel Felix Dunal, 1789–1856. France.
Ehrh. — Friedrich Ehrhart, 1742–1795. Germany.
Ell. — Stephen Elliott, 1771–1830. South Carolina.
Ellis — John Ellis, 1711–1776. England.
Engelm. — George Engelmann, 1809–1884. Missouri.
Fee — Antoine Laurent Apollinaire Fée, 1789–1874. France.
Fisch. — Friedrich Ernst Ludwig von Fischer, 1782–1854. Russia.
Forst. — Johann Reinhold Forster, 1729–1798. Germany. (Also Georg Forster, the son).
Frœl. — Joseph Aloys Frœlich, 1766–1841. Germany.
Gaertn. — Joseph Gaertner, 1732–1791. Germany.
Gaud. — Charles Gaudichaud-Beaupré, 1789–1864. France.
Gmel. — Samuel Gottlieb Gmelin, 1743–1774. Russia.
Gray — Asa Gray, 1810–1888. Harvard University. Massachusetts.
Griseb., Gris. — Heinrich Rudolph August Grisebach, 1814–1879. Germany.
Hassk. — Justus Karl Hasskarl, 1811– . Germany.
Haw. — Adrian Hardy Haworth, 1772–1833. England.
HBK. — Friedrich Alexander von Humboldt, 1796–1859. Germany. Aimé Bonpland, 1773–1858. France. Karl Sigismund Kunth, 1788–1850. Germany.
Herb. — William Herbert, 1778–1847. England.
Hoffm. — Georg Franz Hoffmann, 1761–1826. Germany.
Hook. — William Jackson Hooker, 1785–1865. England.
Hook. f. — Joseph Dalton Hooker, the son, 1817– . England.
Hort. — Used to designate names of horticultural or garden origin.
Jacq. — Nicolaus Joseph Jacquin, 1727–1817. Austria.
Juss. — Antoine Laurent Jussieu, 1748–1836, the first to introduce the natural families of plants. France.

KER — John Bellenden Ker (or Gawler) ? –1871. England.
KLATT — Friedrich Wilhelm Klatt, a contemporaneous botanist. Germany.
KOCH — Karl Koch, 1809–1879. Germany.
KUNTH — See HBK.
LAM. — Jean Baptiste Antoine Pierre Monnet Lamarck, 1744–1829, author of the Lamarckian philosophy of organic evolution. France.
LE CONTE — John Eaton Le Conte, 1784–1860. Pennsylvania.
LEDEB. — Karl Friedrich von Ledebour, 1785–1851. Russia.
LEHM. — Johann Georg Christian Lehmann, 1792–1860. Germany.
LEM. — Charles Lemaire, 1800–1871. Belgium.
L'HER. — C. L. L'Heritier de Brutelle, 1746–1800. France.
LINDEN — J. Linden, 1817– . Belgium.
LINDL. — John Lindley, 1799–1865. England.
LINK — Heinrich Friedrich Link, 1767–1851. Germany.
LINN. — Carolus Linnæus (Carl von Linné), 1707–1778, the "Father of Botany," and author of binomial nomenclature. Sweden.
LINN. f. — Carl von Linné, the son, 1741–1783. Sweden.
LODD. — Conrad Loddiges, nurseryman near London, in the early part of this century.
LOISEL. — Jean Louis Auguste Loiseleur-Deslongchamps, 1774–1849. France.
LOUR. — Juan Loureiro, 1715–1796, Missionary in China. Portugal.
MARSH. — Humphrey Marshall, 1722–1801. Pennsylvania.
MAXIM. — Karl Johann Maximowicz, 1827–1891. Russia.
MEISN. — Karl Friedrich Meisner (or Meissner), 1800–1874. Switzerland.
MEY. — Ernst Heinrich Friedrich Meyer, 1791–1851. Prussia.
MICHX. — André Michaux, 1746–1802. France, but for ten years a resident in North America.
MICHX. f. — François André Michaux, the son, 1770–1855. France.
MILL. — Phillip Miller, 1691–1771. Garden-author of Chelsea, England.
MIQ. — Friedrich Anton Wilhelm Miquel, 1811–1871. Holland.
MOENCH — Konrad Moench, 1744–1805. Germany.
MOQ. — Alfred Moquin-Tandon, 1804–1863. France.
MUHL. — Henry Ludwig Muhlenberg, 1756–1817. Pennsylvania.
MURR. — Johann Andreas Murray, 1740–1791. Germany.
NEES. — Christian Gottfried Nees von Esenbeck, 1776–1858. Prussia.
NUTT. — Thomas Nuttall, 1786–1859. Massachusetts.
ORTEGA, ORT. — Casimiro Gomez Ortega, 1740–1818. Spain.
OTTO — Friedrich Otto, 1782–1856. Germany.
PALL. — Peter Simon Pallas, 1741–1811, professor and explorer in Russia. Germany.
PAXT. — Joseph Paxton, 1802–1865. England.
PERS. — Christian Hendrick Persoon, 1755–1837. Germany.
PLANCH. — Jules Émile Planchon, Professor at Montpellier. France.
POIR. — Jean Louis Marie Poiret, 1755–1834. France.
PRESL — Karel Boriwog Presl, 1794–1852. Bohemia.
PURSH — Fredrick T. Pursh, 1774–1820. Siberia, but for twelve years a resident in the United States.
RADDI — Giuseppe Raddi, 1770–1829. Italy.
RAF. — Constantino Samuel Rafinesque-Schmaltz, 1784–1842, Professor of Natural History at Transylvania University, Lexington, Kentucky.
R. BR. — Robert Brown, 1773–1858. England.
REICH. — Heinrich Gottlieb Ludwig Reichenbach, 1793–1879. Germany.
RICH. — John Richardson, 1787–1865. Scotland.
RICHARD — Louis Claude Marie Richard, 1754–1821. France.
RIDDELL — John Leonard Riddell, 1807–1865, Professor of Chemistry in Cincinnati and New Orleans. Massachusetts.

Roem. — Johann Jacob Roemer, 1763–1819. Switzerland. Also M. J. Roemer.
Roscoe — William Roscoe, 1753–1831. England.
Roxbg. — William Roxburgh, 1759–1815. India.
Ruiz & Pav. — Hipolito Ruiz Lopez, 1764–1815, and José Pavon, authors of a Flora of Peru and Chile. Spain.
Rupr. — Franz J. Ruprecht, 1814–1870. Russia.
Sabine — Joseph Sabine, 1770–1837. England.
Salisb. — Richard Anthony Salisbury, 1761–1829. England.
Schlecht. — Diedrich Franz Leonhard von Schlechtendal, 1794–1866. Germany.
Schrad. — Heinrich Adolph Schrader, 1767–1836. Germany.
Schw., Schwein. — Lewis David von Schweinitz, 1780–1834. Pennsylvania.
Scop. — Johann Anton Scopoli, 1723-1788. Italy.
Sibth. — John Sibthorp, 1758–1796, author of a Flora of Greece. England.
Sieb. & Zucc. — Philipp Franz von Siebold, 1796–1866, and Joseph Gerhard Zuccarini, 1797–1848. Germany.
Sims — John Sims, 1792–1838. England.
Smith — James Edward Smith, 1759–1828. England.
Sol., Soland. — Daniel Solander, 1736–1782. England.
Spach — Eduard Spach, 1801–1879. France.
Spreng. — Kurt Sprengel, 1766–1833. Germany.
Steud. — Ernst Gottlieb Steudel, 1783–1856. Germany.
St. Hil. — Auguste de Saint-Hilaire, 1779–1853. France.
Swartz — Olof Swartz, 1760–1818. Sweden.
Sweet — Robert Sweet, garden-author of the early part of the century. England.
Thunb. — Carl Peter Thunberg, 1743–1822. Sweden.
Torr. — John Torrey, 1796–1873. New York.
Tuckm. — Edward Tuckerman, 1817–1886. Massachusetts.
Vahl — Martin Vahl, 1749–1804. Denmark.
Veitch — John Gould Veitch, 1839–1867, and successors, horticulturists at Chelsea, England.
Vent. — Étienne Pierre Ventenat, 1757–1808. France.
Vill. — Dominique Villars, 1745–1814. France.
Wahl. — Georg Wahlenberg, 1780–1851. Sweden.
Walp. — Wilhelm Gerhard Walpers, 1816–1853. Germany.
Walt. — Thomas Walter, about 1740–1788, author of *Flora Caroliniana*. South Carolina.
Wang. — Friedrich Adam Julius von Wangenheim, 1747–1800. Germany.
Wats. — Sereno Watson, 1826–1892. Harvard University. Massachusetts.
Wendl. — Johann Christoph Wendland, 1755–1828, and Hermann Wendland. Germany.
Willd. — Karl Ludwig Willdenow, 1765–1812. Germany.
With., Wither. — William Withering, 1741–1799. England.

SERIES I.

FLOWERING OR PHÆNOGAMOUS PLANTS.

Plants bearing true flowers; that is, having stamens and pistils, and producing seeds containing an embryo.

Class I. ANGIOSPERMS.

Plants having a closed ovary which contains the ovules: includes all but the Pine and Cycas families.

Subclass I. DICOTYLEDONS (or Exogens).

Distinguished by having the woody strands of the stem in a circle around a pith; the wood often increasing by yearly layers when the stem is more than one year old; the embryo with a pair of cotyledons or seed leaves; leaves generally net-veined; parts of the flower seldom in threes, most commonly in fives or fours. See Lessons, pp. 23, 139. This class includes all our ordinary trees and shrubs, and the greater part of our herbs.

I. Polypetalous Division.

Includes the families which have, at least in some species, both calyx and corolla, the latter with the petals not united with each other. Yet some plants of almost all these families have apetalous flowers, and in some species the petals are more or less united.

I. RANUNCULACEÆ, CROWFOOT FAMILY.

Not perfectly distinguished by any one or two particular marks, but may be known, on the whole, by having numerous stamens, and usually more than one pistil, all the parts of the flower distinct, and inserted on the receptacle. The calyx is often colored like a corolla, when the latter is wanting. The bulk of the seed is hard albumen, the embryo being very small. The plants are herbs with an acrid watery juice (not milky or colored), or a few barely shrubby. Many are cultivated for ornament.

§ 1. *Sepals valvate, or with their edges turned inward in the bud. Petals none, o minute. Leaves opposite, the plants mostly climbing by their leaf-stalks.*

1. CLEMATIS. Sepals commonly 4, sometimes several, petal-like.

§ 2. *Sepals imbricated in the bud. Not climbing, nor woody except in* 22 *and one of* 21.

* *Pistils several or many in a head, ripening into* 1*-seeded akenes.*

+ *Petals none; sepals petal-like.*

++ *All but lower leaves opposite or whorled, often simulating an involucre. Peduncles* 1*-flowered.*

2. ANEMONE. Involucre of 2 or more leaves much below the flower. Pistils very many in a close head (or fewer in one species), forming pointed or tailed akenes.
3. HEPATICA. Involucre close to the flower, exactly imitating a 3-leaved calyx. Pistils 12–20.
4. ANEMONELLA. Involucre at the base of an umbel of flowers. Pistils 4–15.

++ + *Leaves alternate. Flowers in panicles or corymbs.*

5. THALICTRUM. Leaves 2–3-ternately compound (Lessons, Fig. 161).
6. TRAUTVETTERIA. Leaves simple. Flowers perfect.

+ + *Petals and sepals both conspicuous,* 5 *or more.*

7. ADONIS. Petals and sepals with no pit or appendage at the base. Akenes in a head or short spike.
8. MYOSURUS. Sepals with a spur at the base underneath. Petals on a slender claw, which is hollow at its apex. Akenes in a long, tail-shaped spike.
9. RANUNCULUS. Sepals naked. Petals with a little pit or a scale on the short claw. Akenes in a head.

* * *Pistils few, rarely single, ripening into few- to many-seeded pods or berries.*

+ *Ovules, and commonly seeds, more than* 2. *Herbs.*

++ *Flowers regular, not racemose; sepals petal-like.*

= *Petals* 0 *in our species.*

10. ISOPYRUM. Sepals 5, broad, white. Leaves compound.
11. CALTHA. Sepals 5–9, broad, yellow. Leaves simple.

= = *Petals* 5 *or more inconspicuous nectar-bearing bodies, usually very much smaller than the sepals.*

‖ *Leaves palmately parted or divided.*

12. TROLLIUS. Petals with a little depression near the base.
13. HELLEBORUS. Petals hollow and 2-lipped.

‖ ‖ *Leaves distinctly compound.*

14. COPTIS. Leaves of 3 leaflets.
15. NIGELLA. Leaves finely dissected.

— — — *Petals large hollow spurs projecting between the sepals.*

16. AQUILEGIA. Pistils usually 5. Leaves compound.

++++ *Flowers irregular and unsymmetrical, racemose or panicled.*

17. DELPHINIUM. Upper sepal spurred.
18. ACONITUM. Upper sepals in the form of a hood or helmet.

++++++ *Flowers regular, racemose; sepals falling when the flower opens, petal-like.*

19. ACTÆA. Pistil only one, becoming a berry. Flowers in a short and thick raceme or cluster.
20. CIMICIFUGA. Pistils 1–8, becoming pods in fruit. Flowers in long racemes.

++++++++ *Flowers very large, regular, not racemose; sepals herbaceous and persistent.*

21. PÆONIA. Pistils 2 or more, becoming leathery pods.

++ *Ovules a single pair. Flowers regular, solitary, or in compound racemes. Herbs or shrubs.*

22. XANTHORRHIZA. Petals 5, small. Little pods 1-seeded. Undershrub, with yellow wood and roots.
23. HYDRASTIS. Petals none. Fruit berry-like. Low perennial.

1. CLÉMATIS, VIRGIN'S BOWER. (The Greek name of a climbing plant.) Akenes numerous, in a head, the persistent style forming naked, hairy, or plumose tails to the fruit. Many garden hybrids and forms. ♃ Ornamental climbers, with somewhat woody stems; a few are erect herbs. (Lessons, Figs. 278, 279, 378.)

§ 1. *Flowers solitary; climbers.*

* *Sepals thin, spreading, 6 or more.*

C. flórida, Thunb. Flowers 3′–4′ across, sepals broad-ovate, white, purplish, or with a purple center of transformed stamens (var. SIEBÒLDII); leaves usually twice compound. Japan.

C. lanuginòsa, Lindl. Cult. from China. Flowers 6′–10′ across, lavender. Leaves thick, usually simple (rarely ternate), cordate, acute, smooth above, hairy below; buds woolly.

C. JACKMÁNNI of gardens is a hybrid between this species and C. Viticella.

C. pàtens, Morr. & Dcne., also called C. CŒRÙLEA, and various names for varieties. Flower 5′–7′ across, with 6–9 or more oblong or lance-shaped sepals of various colors; leaflets simply in threes. Japan.

* * *Sepals thin, spreading, 4 only.*

C. verticillàris, DC. Flowers about 3′ across, sepals bluish-purple, acute; leaflets mostly entire; akenes with feathery tails. Rocky woods or ravines N. and in mountainous parts.

C. Viticélla, Linn. VINE BOWER C. From Eu.; a hardy climber, with flower 2′–3′ across; the widely spreading sepals obovate, either purple or blue; akenes with short, naked points.

C. orientàlis, Linn. HEAVY-SCENTED C. Cult. from Central Asia; flowers yellow, 1½′ across, sepals ovate, bluntish; long and feathery tails to the akenes. In cult. as C. GRAVÈOLENS.

* * * *Sepals thick, leathery, erect.*

C. Viórna, Linn. LEATHER FLOWER. Wild from Penn. and Mo., S., in rich soil; sepals purple or purplish, 1′ long or more, erect, and with the narrow tips only spreading or recurved; akenes with very feathery tails.

C. Pítcheri, Torr. & Gray. Wild from S. Ind. to Kans. and Tex., has a flower much like the preceding, but the tails of the akenes are filiform and naked, or slightly hairy, but not feathery.

C. crispa, Linn. Calyx cylindraceous below, upper part bluish; sepals with broad, thin wavy margins; tails of akenes silky or smooth. Va. and S.; also cult.

§ 2. *Flowers solitary; low, erect herbs.*

C. ochroleùca, Ait. Pale C. Wild from Long Island S., but scarce; has ovate silky leaves and dull silky flowers on long stalks; tails of akenes very feathery.

C. Fremónti, Wats. Leaves thick and often coarsely toothed; sepals purple, woolly on the edge; tails short, hairy, or smooth. Mo. and Kans., the western representative of the preceding.

§ 3. *Flowers small, white, panicled.*

* *Herbaceous, erect.*

C. récta, Linn. Upright Virgin's Bower. 3°–4° high, with large panicles of white flowers in early summer; leaves pinnate; leaflets ovate or slightly heart-shaped, pointed, entire. Eu.

* * *Woody, climbing.*

C. Flámmula, Linn. Sweet-scented V. Flowers perfect, with copious sweet-scented flowers at midsummer in small and rather simple panicles; sepals woolly on outside near the edge only; leaflets 3–5 or more of various shapes, often lobed or cut.

C. Vitálba, Linn. Flowers perfect, greenish-white; sepals woolly on both surfaces; leaves pinnate, of 5 ovate leaflets. S. Eu.

C. Virginiàna, Linn. Common Wild V. Flowers dicœcious, late in summer; leaflets 3, cut-toothed or lobed.

C. paniculàta, Thunb., from Japan, and now becoming popular, hardy N., has large panicles of small, white, fragrant, perfect flowers in midsummer, and 3–7 small mostly cordate-ovate, acute leaflets.

2. ANEMÒNE, ANEMONE, WINDFLOWER. (Greek, *shaken by the wind*, because growing in windy places, or blossoming at the windy season.) 2ℓ Erect herbs. Sepals 4–20. (Lessons, Figs. 233, 343.)

§ 1. *Long hairy styles form feathery tails to the akenes. Flowers large, purple, in early spring.*

A. Pulsatílla, Linn. Pasque Flower of Europe. Cult. in some flower-gardens, has the root-leaves finely thrice-pinnately divided or cut; otherwise much like the next.

A. pàtens, var. **Nuttalliàna**, Gray. Wild P. Prairies, Ill., Mo., and N. W. The handsome purplish or whitish flower (1′–1½′ across when open), rising from the ground on a low, silky-hairy stem (3′–6′ high), with an involucre of many very narrow divisions; the leaves from the root appearing later, and twice or thrice ternately divided and cut.

§ 2. *Short styles not making long tails, but only naked or hairy tips.*

* *Cult. species, exotic, with tuberous or woody rootstocks and very large flowers.*

A. coronària, Linn. Leaves cut into many fine lobes; sepals 6 or more, broad and oval; and

A. horténsis, Thor., perhaps a var. of preceding, with leaves less cut into broader wedge-shaped divisions and lobes, and many longer and narrow sepals, are the originals of the spring-flowered, mostly double or semi-double, Garden Anemones of many colors.

A. Japónica, Sieb. & Zucc. 2°–3° high, flowering in autumn; flowers 2′–3′ across, rose-color or white; leaves ternate, the leaflets variously cut and toothed. Hardy. China.

* * *Wild species, smaller-flowered.*

+ *Akenes densely woolly and very numerous.*

++ *Stems single, 3′–6′ high, from a small tuber; sepals 10–20; involucre sessile.*

A. Caroliniàna, Walt. Involucre 3-parted, its wedge-shaped divisions 3-cleft, purple or whitish. N. C. west to Ill. and Neb. May.

++++ *Stems branched, 2°–3° high; leaves of the involucre long-petioled, compound; sepals 5, small, greenish-white, silky beneath.*

A. cylíndrica, Gray. Long-fruited A. Involucre several-leaved surrounding several long, naked peduncles; flowers late in spring (in dry soil N. and W.), followed by a cylindrical head of fruit.

A. Virginiàna, Linn. Virginian A. Involucre 3-leaved; peduncles formed in succession all summer, the middle or first one naked, the others bearing 2 leaves (involucel) at the middle, from which proceed two more peduncles, and so on; head of fruit oval or oblong. Common in woods and meadows.

+ + *Akenes not woolly, fewer; flower 1′ broad or more.*

A. Pennsylvánica, Linn. Pennsylvanian A. Stem 1° high, bearing an involucre of 3 wedge-shaped 3-cleft and cut sessile leaves, and a naked peduncle, then 2 or 3 peduncles with a pair of smaller leaves at their middle, and so on; flowers white in summer. (Lessons, Fig. 233.) Alluvial ground, N. and W.

A. nemoròsa, Linn. Wood A. Stem 4′–10′ high, bearing an involucre of 3 long-petioled leaves of 3 or 5 leaflets, and a single short-peduncled flower; sepals white, or purple outside. Woodlands, early spring.

3. HEPÁTICA, LIVERLEAF, HEPATICA. (Shape of the leaves likened to that of the liver.) Among the earliest spring flowers. Stemless low 2*l*, with 3-lobed leaves and 1-flowered scapes. The involucre is so close to the flower and of such size and shape that it is most likely to be mistaken for a calyx, and the six or more oblong, colored sepals for petals.

H. tríloba, Chaix. Round-lobed H. Leaves with 3 broad and rounded lobes, appearing later than the flowers, and lasting over the winter; stalks hairy; flowers blue, purple, or almost white. Woods, common. Full double-flowered varieties, blue and purple, are cult. from Eu. Atlantic to Mo. and N.

H. acutíloba, DC. Sharp-lobed H. Has pointed lobes to the leaves, sometimes 5 or 7 them, and paler flowers. Passes into the last; same range.

4. ANEMONÉLLA, RUE ANEMONE. (Name diminutive of *Anemone*.) Petals 0. Sepals 5–10, white. Leaves compound, radical, except the involucral. Akenes 8–10-ribbed. Low, smooth, 2*l*

A. thalictroìdes, Spach. Rue Anemone. Smooth and delicate, somewhat resembling Wood Anemone; stem-leaves none, except those that form an involucre around the umbel of white (rarely pinkish) flowers, appearing in early spring; leaflets roundish, 3-lobed at the end, long-stalked; stigma flat-topped, sessile; roots clustered, very fleshy.

5. **THALÍCTRUM**, MEADOW RUE. (Old name of obscure derivation.) (Lessons, Fig. 161.) 2

* *Flowers mostly dioecious, small, in loose compound panicles; the 4 or 5 sepals falling early; filaments slender; stigmas slender; akenes several-grooved and angled.*

T. dioìcum, Linn. EARLY MEADOW RUE. Herb glaucous, 1°–2° high; flowers greenish in early spring; the yellowish linear anthers of the sterile plant hanging on long capillary filaments; leaves all on general petioles. Rocky woods.

T. polýgamum, Muhl. TALL M. Herb 4°–8° high; stem-leaves not raised on a general petiole; flowers white in summer; anthers oblong, blunt, not drooping; the white filaments thickened upwards. Low or wet ground.

T. purpuráscens, Linn. PURPLISH M. Later, often a little downy, 2°–4° high; stem-leaves not raised on a general petiole; flowers greenish and purplish; anthers short-linear, drooping on capillary and upwardly rather thickened filaments. Dry uplands and rocky hills.

* * *Flowers all perfect, corymbed; filaments strongly club-shaped or inflated under the short anther; stigmas short; akenes long-stalked.*

T. clavàtum, DC., has the size and appearance of T. dioicum; flowers white, fewer, appearing in June or July; mountains southward.

6. **TRAUTVETTÈRIA**, FALSE BUGBANE. (For *Trautvetter*, a Russian botanist.) One species, with numerous 4-angled, capitate, inflated akenes. 2

T. palmàta, Fisch. & Meyer, along streams of S. Central States. Stems 2°–3° high; root-leaves large, palmately 5–11-lobed, the lobes toothed and cut.

7. **ADÒNIS**. (Adonis, killed by a wild boar, was fabled to have been changed at death into a flower.) Stems leafy; leaves finely much cut into very narrow divisions. Cult. from Europe for ornament.

A. æstivàlis, Linn. ① Stems about 1° high; flower deep crimson; petals flat, half longer than calyx.

A. autumnàlis, Linn. PHEASANT'S EYE A. ① Near 1° high, stem or its branches terminated by a small globose flower of 5–8 scarlet or crimson petals, concave, commonly dark at base, scarcely larger than sepals. Sparingly naturalized.

A. vernàlis, Linn. SPRING A. 2 Stems about 6′ high, bearing a large, showy flower of 10–20 lanceolate, light-yellow petals in early spring.

8. **MYOSÙRUS**, MOUSETAIL (which the name means in Greek). ①

M. mínimus, Linn. An insignificant little plant, wild or run wild along streams from Illinois S., with a tuft of narrow entire root-leaves, and scapes 1′–3′ high, bearing an obscure yellow flower, followed by tail-like spike of fruit, 1′–2′ long in spring and summer.

9. **RANÚNCULUS**, CROWFOOT, BUTTERCUP. (Latin name for a little frog, and for the Water Crowfoots, living with the frogs.) A large genus of plants, wild with the exception of the double-flowered varieties of three species cult. in gardens for ornament. (Lessons, Figs. 245, 341, 376, 377.)

§ 1. *Aquatic; the leaves all or mostly under water, and repeatedly dissected into many capillary divisions; flowering all summer.*

* *Petals white, or only the claw yellow.*

R. circinàtus, Sibth. STIFF WATER CROWFOOT. Leaves sessile, stiff, and rigid enough to keep their shape (spreading in a circular outline) when drawn out of water. Rarer than the next.

R. aquátilis, var. **trichophýllus**, Gray. WHITE W. Capillary leaves petioled, collapsing into a tuft when drawn out of the water; petals small, white, or yellow only at the base, where they bear a spot or little pit, but no scale; akenes wrinkled crosswise. Common.

* * *Petals bright yellow.*

R. multífidus, Pursh. YELLOW W. Leaves under water, much like those of the White Water Crowfoots, or rather larger; but the bright yellow petals ½′ long, with a little scale at the base.

§ 2. *Terrestrial, many in wet places, but naturally growing with the foliage out of water; petals with a little scale at the base, yellow in all the wild species.*

* *Akenes striate, or ribbed down the sides.* ①

R. Cymbalària, Pursh. SEA SIDE CROWFOOT. A little plant of sandy shores of the sea and Great Lakes, etc., smooth, with naked flowering stems 2′–6′ high, and long runners; leaves rounded and kidney-shaped, coarsely crenate; flowers small in summer.

* * *Akenes not prickly nor bristly nor striate on the sides.* 2ℓ

+– SPEARWORTS, *growing in very wet places, with entire or merely toothed leaves, all, or all but the lowest, lanceolate or linear; flowers all summer.*

+– *Pistils flattened, pointed, or beaked.*

R. ámbigens, Wats. WATER PLANTAIN SPEARWORT. Stems ascending, 1°–2° high; leaves lanceolate, or the lowest oblong; flower fully ½′ in diameter; akenes beaked with a straight and slender style. Common.

R. Flámmula, Linn. SMALLER SPEARWORT. Smaller than the last, and akenes short-pointed; rare N., but very common along borders of ponds and rivers is the

Var. **réptans**, Meyer, or CREEPING S., with slender stems creeping a few inches in length; leaves linear or spatulate, seldom 1′ long; flower only ¼′ broad.

+– +– *Pistils globular, pointless. Stems not rooting.*

R. oblongifòlius, Ell. Diffusely branched above and many-flowered; leaves serrate or denticulate; lower ovate or oblong, upper linear. Ill., Mo., and So. States.

R. pusíllus, Poir. Differs from the preceding chiefly in the broader entire leaves; the lower round, ovate, or heart-shaped, upper oblong or lanceolate. N. Y. and S. along the coast.

+– +– CROWFOOTS *in wet or moist places, with all or at least the upper leaves 3-parted or divided.*

+– *Root-leaves roundish, crenate, or toothed, but not lobed or cleft.*

R. rhomboídeus, Goldie. Hairy, 3′–8′ high; petals large, deep yellow. Prairies, Mich. to N. Ill., Minn. and W.

R. abortìvus, Linn. Very smooth and slender (rarely pubescent = var. *micranthus*), 6′–2° high; petals shorter than sepals, pale yellow. Very common in shady moist places in spring.

+– +– *Root-leaves variously lobed, cleft, or parted.*

= *Pistils in oblong or cylindrical clusters.*

R. affinis, R. Br. Low or slender, 1° high or less; root-leaves pedately many-cleft; styles recurved. Iowa, N., and W.

R. sceleràtus, Linn. Cursed C. So called because the juice is very acrid and blistering; very smooth; stem thick and hollow; root-leaves 3-lobed; styles very short, straight. In water or very wet places.

R. Pennsylvánicus, Linn. f. Bristly C. Bristly, hairy, coarse, and stout, 2°–3° high; leaves all 3-divided; the divisions stalked, again 3-cleft, sharply cut and toothed; akenes tipped with a short straight style. Along streams.

= = *Pistils in globular clusters.*

‖ *Petals small, not exceeding the sepals.*

R. recurvàtus, Poir. Hook-styled C. Hairy, 1°–2° high; leaves all 3-cleft and long-petioled, with broad, wedge-shaped, 2–3-lobed divisions; akenes with long recurved styles. Woods.

‖ ‖ *Petals large, bright yellow, much exceeding the sepals.* (Buttercups.)

○ *Styles long and attenuate, stigmatose only at tip.*

R. fasciculàris, Muhl. Early B. Low, about 6′ high, without runners; roots thickened; root-leaves much divided, somewhat pinnate; petals rather narrow and distant; akenes scarcely edged, slender-beaked. On rocky hills in early spring.

R. septentrionàlis, Poir. Creeping B. Everywhere common in very wet or moist places, flowering in spring and summer; variable; stem soon ascending, sending out some prostrate stems or runners in summer; leaves more coarsely divided and cleft than those of the last; petals obovate; akenes sharp-edged and stout-beaked.

R. bulbòsus, Linn. Bulbous B. Stem about 1° high from a solid bulbous base nearly as large as a hickory nut; peduncles grooved; calyx reflexed when the very bright yellow and showy large corolla expands in late spring. Abundant only in E. New Eng.; rare W.

R. àcris, Linn. Tall B. Stem 2°–3° high, no bulbous base; peduncles round, not grooved; calyx only spreading when the lighter yellow corolla expands in summer. Commoner than the last, except E. A full double-flowered variety is cult. in gardens, forming golden-yellow balls or buttons.

○ ○ *Styles awl-shaped, stigmatose along the inner edge.*

R. rèpens, Linn. Creeping B. In habit and foliage like R. septentrionalis; leaves frequently white-variegated or spotted; calyx spreading, peduncles grooved. In low grounds, E. where it is probably nat. from Eu.; native W. A full double form in gardens.

+ + + Garden Ranunculuses. *Besides the double variety of R. repens, the choice Double Ranunculuses of the florist come from the two following:* —

R. Asiáticus, Linn., of the Levant; with 3-parted leaves and flowers nearly 2′ broad, resembling Anemones, yellow, or of various colors. Not hardy N.

R. aconitifòlius, Linn., of Eu., taller, smooth, with 5-parted leaves, and smaller white flowers, the full double called Fair Maids of France.

10. ISOPŸRUM. (Greek: ancient name of a Fumaria.) Sepals petal-like, deciduous; stamens 10–40; pistils 3–6; pods 2–several-seeded. 2ℓ Slender and smooth, with 2–3-ternately compound leaves, the leaflets 2–3-lobed. Flowers axillary and terminal. (Lessons, Fig. 292.)

I. biternàtum, Torr. & Gray. O. to Minn. and S. Much like Anemonella in general appearance, but the roots are fibrous, and tuberous-thickened here and there.

11. CÁLTHA, MARSH MARIGOLD. (A Latin name for the common Marigold.) (Lessons, Figs. 325, 392.) 2/ One common species N.

C. palústris, Linn. MARSH MARIGOLD, wrongly called COWSLIP in the country. Stem 1°–2° high, bearing one or more rounded or somewhat kidney-shaped, entire or crenate leaves, and a few flowers with showy yellow calyx, about 1½′ across; followed by a cluster of many-seeded pods. Marshes in spring; young plant boiled for "greens."

12. TRÓLLIUS, GLOBEFLOWER. (German: *troll*, a globe, or something round?) Flower large, like that of Caltha, but the 5–many sepals not spreading except in our wild species; a row of small nectary-like petals around the stamens, and the leaves deeply palmately cleft or parted, 2/ Flowers spring.

T. láxus, Salisb. WILD G. Sepals only 5 or 6, spreading wide open, yellowish or dull greenish-white; petals very small, seeming like abortive stamens. Swamps, N. H. to Del. and Mich. Also W.

T. Europæus, Linn. EUROPEAN G. Sepals bright yellow (10–20), or white, broad, and converging into a kind of globe, the flower appearing as if semi-double; petals equaling the stamens. Eu.

T. Asiáticus, Linn. ASIATIC G. Like the last, but flower rather more open, and deep orange, yellow, or white; the petals longer than stamens. Siberia.

13. HELLÉBORUS, HELLEBORE. (Old Greek name of unknown meaning.) 2/ Sepals 5, persistent, enlarging, and becoming green after flowering. European plants, with pretty, large flowers, in early spring.

H. víridis, Linn. GREEN H., has stems near 1° high, bearing 1 or 2 leaves and 2 or 3 pale yellowish-green flowers; run wild in a few places E.

H. níger, Linn. BLACK H., the flower called CHRISTMAS ROSE (because flowering in warmer parts of England in winter), has single large flowers (2′–3′ across, white, turning pinkish, then green), on scapes shorter than the shining evergreen leaves in earliest spring. Garden varieties are more commonly cult. than the species.

14. CÓPTIS, GOLDTHREAD. (Greek: *to cut*, from divided leaves.) 2/ Sepals 5–7, deciduous. The only common species is

C. trifòlia, Salisb. THREE-LEAVED G. A delicate little plant in bogs and damp cold woods N., sending up early in spring single white flowers (smaller than those of Wood Anemone) on slender scapes, followed by slender-stalked leaves of three wedge-shaped leaflets; these become bright-shining in summer, and last over winter. The long, slender, bright yellow, underground stems are used as a popular medicine.

15. NIGÉLLA, FENNEL FLOWER. (Name from the black seeds.) ① Garden plants from Eu. and Orient; stems leafy; the 5 ovaries united below into one 5-styled pod. Seeds large, blackish, spicy. One species has been used as a substitute for spice or pepper.

N. Damascèna, Linn. COMMON F. or RAGGED LADY. LOVE-IN-A-MIST. Flower bluish, rather large, surrounded and overtopped by a finely divided, leafy involucre, like the other leaves; succeeded by a smooth, inflated, 5-celled pod in which the lining of the cells separates from the outer part.

16. AQUILÈGIA, COLUMBINE. (From Latin *aquilegus, water-drawing*, of obscure application.) 2ℓ Well-known ornamental herbs, flowering in spring and early summer, with erect or dropping flowers of various colors. Sepals 5, colored; petals 5, each produced into a long, slender, straight, or hooked spur; pistils 5, forming narrow pods. Leaves ternately compound or decompound. The species are much modified by cultivation, and garden forms are rarely typical. Often, but erroneously, called HONEYSUCKLE.

* *Corolla with long straight spurs; North American species.*

+– *Flowers pendulous, the spurs therefore ascending, often red.*

A. Canadénsis, Linn. WILD C. Flowers about 2′ long, scarlet and orange, or light yellow inside, the petals with a very short lip or blade, and stamens projecting. Common on rocks.

A. Skínneri, Hook. MEXICAN C., is taller, later, and considerably larger-flowered than the last, the narrower acute sepals usually tinged greenish; otherwise very similar.

A. truncàta, Fisch. & Meyer (also known as A. CALIFÓRNICA and A. EXÍMIA), from California is 1°–2° high, with red, yellow-tinged flowers 1′–2½′ across, spreading or reflexed sepals, and petals truncate with a very short limb; spurs ½′–¾′ long, thick, and blunt.

A. formòsa, Fischer. Flower carmine-red or scarlet, spurs about equaling the wide-spreading sepals, only about twice the length of the roundish yellow blade, the limb of the petals longer than in the last, and extending upwards on the outer side. Rocky Mountains.

+– +– *Flowers erect or becoming so, never red.*

A. cærùlea, James. LONG-SPURRED C., native of the Rocky Mountains, has blue and white flowers, the ovate sepals often 1½′, the very slender spurs 2′ long, the blade of the petals (white) half the length of the (mostly blue) sepals, spreading.

A. chrysántha, Gray, from New Mex. and Ariz., has bright yellow flowers, the sepals lance-oblong and about equaling the blade of the petals; spurs long (2½′–3′).

* * *Corolla with hooked or incurved spurs; Old World.*

A. vulgàris, Linn. COMMON GARDEN C. Common in gardens, 1°–3° high, many-flowered; spurs rather longer than the blade or rest of the petal; pods pubescent. Flowers varying from blue to purple, white, etc., greatly changed by culture, often full double, with spur within spur, sometimes all changed into a rosette of plane petals or sepals.

A. glandulòsa, Fischer. GLANDULAR C. A choice species, 6′–1° high, with fewer, very showy deep blue flowers, the blade of the petals white or white-tipped and twice the length of the short spurs; pods and summit of the plant glandular-pubescent.

A. Sibírica, Lam. SIBERIAN C. Equally choice with the last, and like it; but the spurs longer than the mostly white-tipped short blade, as well as the pods, etc., smooth.

17. DELPHÍNIUM, LARKSPUR. (Latin: *dolphin*, alluding to the shape of the flower.) The familiar and well-marked flower of this genus is illustrated in Lessons, Figs. 239–241; the seed in Figs. 421, 422.

* *Annuals; petals* 2, *united; pistil* 1; *the leaves finely and much divided; flowers summer and fall.*

D. Consólida, Linn. FIELD L. Escaped sparingly into roadsides and fields, flowers scattered on the spreading branches, blue, varying to pink or white; pod smooth. Eu.

D. Ajàcis, Linn. Rocket L. More showy in gardens, and with similar flowers crowded in a long close raceme, and downy pods; spur shorter; some marks on the front of the united petals were fancied to read AIAÏ = Ajax. Eu.

* * *Perennials, with 4 separate petals and 2-5, mostly 3, pistils.*

+ *Flowers deep blue to white; cultivated.*

D. grandiflòrum, Linn. Great-fl L. (Known also as D. Chinénse and D. Sinénse). 1°–2° high, leaves cut into narrow linear divisions; flowers $1\frac{1}{2}'$ or more across; sepals ample, oval; the 2 lower petals rounded and entire. Various in color, also double-flowered; summer. Siberia and China.

D. cheilánthum, Fischer, commonly still larger-flowered, with lower petals also entire or nearly so; the mostly downy leaves have fewer and lanceolate or wedge-lanceolate divisions; is now much modified by cultivation. D. formòsum, Showy L., is one of the various garden forms. Summer. Siberia.

D. elàtum, Linn. Bee Larkspur, from Eu., is very tall and somewhat pubescent, with leaves 5–7-cleft, and the long divisions lobed or toothed; flowers many in a long wand-like raceme, the lower petals 2-cleft and yellowish bearded; spur curved.

+ + *Flowers deep blue to white; indigenous.*

D. exaltàtum, Ait. Tall Wild L. 2°–5° high; leaves deeply 3–5-cleft, the divisions narrow, wedge-form, or wedge-oblong, diverging 3-cleft at apex; flowers and panicled racemes hoary or downy; spur straight; pods erect; summer. Penn., W. and S.

D. azùreum, Michx. Azure L. Often downy, 1°–3 high°, with narrow linear divisions to the leaves, and a spike-like raceme of rather small flowers in spring; sepals and 2-cleft lower petals oblong; spurs curved up; pods erect. Var. with full double flowers in gardens; summer. Wis. to Dak. and S.

D. tricórne, Michx. Dwarf Wild L. 6′–3° high, from a branched tuberous root; leaves with broadly linear lobes and a loose raceme of few or several rather large showy flowers in spring; sepals and cleft lower petals oblong; pods strongly diverging. Open woods from Penn., W. and S.

+ + + *Flowers scarlet and yellow; cult. from California.*

D. nudicaúle, Torr. & Gray. 1°–2° high, few-leaved, leaves deeply cleft into obovate or wedge-shaped divisions; racemes loose; pedicels 2′–4′ long.

18. ACONÌTUM, ACONITE, WOLFSBANE, MONKSHOOD. (Ancient name.) ♃ Root thick, tuberous, or turnip-shaped, a virulent poison, and used as medicine. Leaves palmately divided or cleft and cut-lobed. Flowers showy. The large upper sepal from its shape is called the *hood* or *helmet.* Under it are two long-stalked, queer little bodies which answer for petals. (Lessons, Figs. 242–244.) Flowers in summer.

* *Leaves deeply cleft into 3–7 lobes.*

A. uncinàtum, Linn. Wild A. or Monkshood. Stem slender, 3°–5°, erect, but weak and inclined to climb; leaves cleft or parted into 3–5 ovate or wedge-lanceolate, cut-toothed lobes; flowers loosely panicled, blue; the roundish helmet nearly as broad as high, its pointed visor turned down. Low grounds from Penn., S. and W.

A. reclinàtum, Gray. Trailing Wolfsbane. Smooth, stems trailing; leaves deeply 3–7-cleft; flowers white; helmet soon horizontal, elongated conical. Alleghany Mountains, S.

* * *Leaves divided to very base.*

A. variegàtum, Linn. VARIEGATED A. Erect, 1°–6° high; leaves divided into rather broad-lobed and cut divisions; flowers in a loose panicle or raceme, blue and often variegated with white, or whitish; the helmet considerably higher than wide, its top curved forward, its pointed visor ascending or horizontal. Eu.

A. Napéllus, Linn. TRUE MONKSHOOD OR OFFICINAL ACONITE, from Eu. Erect, 3°–4° high, from a turnip-shaped root; divisions of leaves 2–3 times cleft into linear lobes; flowers crowded in a close raceme, blue (also a white variety); helmet broad and low.

A. Anthora, Linn. Erect, 1°–2° high; leaves very finely divided into linear lobes; crowded flowers yellow; helmet broad, rather high. Eu. Various garden forms.

19. ACTÆA, BANEBERRY. (Greek name of the Elder, from some likeness in the leaves.) *2l* Flowers in spring, ripening the berries late in summer; growing in rich woods. Leaflets of the thrice-ternate leaves ovate, sharply cleft, and cut-toothed.

A. spicàta, var. **rùbra,** Ait. RED BANEBERRY. Flowers in a very short, ovate raceme or cluster, on slender pedicels; berries red.

A. álba, Bigel. WHITE BANEBERRY. Taller than the other, smoother, and flowering a week or two later, with an oblong raceme; pedicels in fruit very thick, turning red, the berries white.

20. CIMICÍFUGA, BUGBANE. (Latin: *to drive away bugs.*) *2l* Like baneberry, but tall, with very long racemes (1°–3°), and dry pods instead of berries; flowers in summer.

C. Americàna, Michx. AMERICAN B. Slender, 2°–4° high; pistils 5, with slender style and minute stigma; pods raised from the receptacle on slender stalks, flattish, containing few scaly-coated seeds. Alleghanies from Penn., S.; flowers, late summer.

C. racemòsa, Nutt. TALL B. OR BLACK SNAKEROOT. Stem with the long raceme 4°–8° high; pistil mostly single, with a flat-topped stigma; short pod holding 2 rows of horizontally flattened seeds. Rich woods.

21. PÆÒNIA, PEONY. (Ancient name, after a Greek physician, *Pæon.*) *2l* Well-known large-flowered ornamental plants, cult. from the Old World. A fleshy disk at the base of the 2 or more pistils which form leathery pods in fruit. Seeds large, rather fleshy-coated. Leaves ternately decompound. Roots thickened below. Known in old gardens as PINEY.

* *Herbs with single-flowered stems in spring, and downy pods.*

P. officinàlis, Retz. COMMON P. Very smooth, with large, coarsely divided, green leaves; the great flowers red, white, etc., single or very double.

P. peregrìna, Mill., including P. PARADÓXA. Leaves glaucous and more or less downy beneath, and smaller flowers than the last, rose-red, etc., generally full double, with the petals cut and fringed.

P. tenuifòlia, Linn. SLENDER-LEAVED P. Low, with early crimson red flowers, and narrow linear divisions to the leaves. Siberia.

* * *Herbs with several-flowered stems in summer, and smooth pods.*

P. albiflòra, Pall. WHITE-FL. OR FRAGRANT P., OR CHINESE P. Very smooth, about 3° high, with bright green foliage, and white or rose-colored, often sweet-scented, rather small flowers, single, also double, and with purple varieties.

* * * *Shrubby; flowers in spring and early summer.*

P. Moûtan, Sims. TREE PEONY of China. Stems 2°–3° high; leaves pale and glaucous, ample; flowers very large (6′ or more across), white with purple base, or rose-color, single or double; the disk, which in other species is a mere ring, in this forms a thin fleshy sac or covering, inclosing the 5 or more ovaries, but bursting and falling away as the pods grow.

22. XANTHORRHÌZA, SHRUB YELLOWROOT. (Greek: *yellow, root.*) Only one species.

X. apiifòlia, L'Her. A shrubby plant, 1°–2° high, with deep yellow wood and roots (used by the Indians for dyeing), pinnate leaves of about 5 cut-toothed or lobed leaflets, and drooping compound racemes of small, dark or dull purple flowers in early spring, followed by little 1-seeded pods; grows in damp, shady places. Penn., to N. Y., and Ky.; S. along the mountains.

23. HYDRÁSTIS, ORANGEROOT, YELLOW PUCCOON, GOLDEN SEAL. (Name of no application.) 2

H. Canadénsis, Linn. Low, sending up in early spring a rounded 5–7-lobed root-leaf, and a stem near 1° high, bearing 1 or 2 alternate, smaller leaves above, just below the single small flower. The 3 greenish sepals fall from the bud, leaving the many white stamens and little head of pistils; the latter grow pulpy and produce a crimson fruit resembling a raspberry. Rich woods from New York, W. and S.

II. MAGNOLIACEÆ, MAGNOLIA FAMILY.

Trees or shrubs, with aromatic bitter bark, bud-scales formed of stipules (Lessons, p. 66, Figs. 179, 180), simple mostly entire alternate leaves, and solitary flowers; the similar sepals and petals (rarely 0) on the receptacle in three or more rows of three, imbricated in the bud; pistils 2–5, or numerous, the carpels cohering and covering the elongated receptacle, forming a sort of cone in fruit; stamens numerous, with adnate anthers (Lessons, p. 101, Fig. 293); seeds only 1 or 2 in each carpel; embryo small.

I. Stipules forming the bud-scales, and falling early. Flowers perfect and large, or smaller and diœcious in No. 3.

1. LIRIODENDRON. Sepals 3, reflexed. Corolla bell-shaped, of 6 broad, greenish-orange petals. Stamens almost equaling the petals, with slender filaments, and long anthers opening outwards. Carpels thin and scale-form, closely packed over each other, dry in fruit, and after ripening separating and falling away from the slender axis; the wing-like portion answering to style; the small seed-bearing cell, at the base and indehiscent. Leaf-buds flat; stipules free from the petiole.
2. MAGNOLIA. Sepals 3. Petals 6 or 9. Stamens short, with hardly any filaments; anthers opening inwards. Carpels becoming fleshy in fruit and forming a red or rose-colored cone, each when ripe (in autumn) splitting down the back and discharging 1 or 2 coral-red, berry-like seeds, which hang on extensile cobwebby threads. Stipules united with the base of the petiole, falling as the leaves unfold.
3. CERCIDIPHYLLUM. Calyx and corolla 0. Stamens many, filaments capillary. Pistils stalked, forming 2–6 narrowly oblong follicles. Seeds numerous.

II. Stipules none. Flowers not very large, perfect or dioecious. Two Southern plants which have been made the representatives of as many small orders.

4. ILLICIUM. Flowers perfect. Petals 9–30. Stamens many, separate. Pistils several in one row, forming a ring of almost woody little pods.

5. SCHIZANDRA. Flowers monœcious. Petals mostly 6. Stamens 5, united into a disk or button-shaped body, which bears 10 anthers on the edges of the 5 lobes. Pistils many in a head, which lengthens into a spike of scattered red berries.

1. LIRIODÉNDRON, TULIP TREE (which is the meaning of the name in Greek).

L. Tulipífera, Linn. A tall, very handsome tree in rich soil, commonest W., where it, and the light and soft lumber (much used in cabinet-work), is called WHITE-WOOD, and erroneously POPLAR and WHITE POPLAR; planted for ornament; flowers late in spring, yellow with greenish and orange. Leaves with 2 short side-lobes, and the end as if cut off

2. MAGNÒLIA. (Named for *Magnol*, professor of botany at Montpellier in 17th century.) Some species are called UMBRELLA TREES from the way the leaves are placed on the end of the shoots; others, CUCUMBER TREES from the appearance of the young fruit. (Lessons. Figs. 179, 348–355.)

* *Native trees of this country, often planted for ornament; flowers appearing after the leaves.*

+– *Leaves all scattered along the branches; leaf-buds silky.*

++ *Leaves coriaceous, evergreen (in the second only so at S.).*

M. grandiflòra, Linn. GREAT-FLOWERED MAGNOLIA of S., half-hardy in the Middle States. The only perfectly evergreen species; splendid large tree with coriaceous oblong or obovate leaves, shining above, mostly rusty beneath; the flowers very fragrant, white, 6′–9′ broad, in spring.

M. glaùca, Linn. SMALL or LAUREL M., SWEET BAY. Wild in swamps N. to New Jersey, Penn., and E. Mass.; a shrub or small tree, with oval, broadly lanceolate, obtuse leaves, glaucous beneath, and globular, white, and very fragrant flowers (2′–3′ wide) in summer.

–+ –+ *Leaves thin, deciduous.*

= *Green beneath.*

M. acuminàta, Linn. CUCUMBER TREE. Wild from Western N. Y. to Ill. and S.; a stately tree, with the leaves thin, green, oblong, acute at both ends, and somewhat downy beneath, and oblong-bell-shaped pale yellowish-green flowers (2′ broad), late in spring.

= = *Whitish, downy, or glaucous beneath.*

M. cordàta, Michx. YELLOW CUCUMBER M. of Georgia, hardy even in New England; like the last, but a small tree with the leaves ovate or oval, seldom cordate; flowers lemon-yellow.

M. macrophýlla, Michx. GREAT-LEAVED M. of the S., nearly hardy N. to Mass. A small tree, with leaves very large (2°–3° long), obovate-oblong with a cordate base, downy and white beneath, and an immense open, bell-shaped flower (8′–12′ wide when outspread), somewhat fragrant in early summer; petals ovate, white, with a purple spot at the base.

← ← Leaves crowded in an umbrella-like cluster; leaf-buds smooth.

M. Umbrélla, Lam. UMBRELLA TREE (also called M. TRIPÉTALA). Wild in S. Penn. and southward. A low tree, with the leaves smooth and green both sides, obovate-lanceolate, pointed at both ends, 1°–2° long, surrounding a large white flower, in spring; the petals 4′–5′ long, obovate-lanceolate and acute, narrowed at the base; the ovate-oblong cone of fruit showy in autumn, rose-red, 4′–5′ long.

M. Fràseri, Walt. EAR-LEAVED UMBRELLA TREE (also called M. AURICULÀTA). Wild from Virginia S., hardy as the last, and like it; but a taller tree, with the leaves seldom 1° long and auricled on each side at the base, the white obovate-spatulate petals more narrowed below into a claw; cone of fruit smaller.

** * Chinese and Japanese species; flowers appearing before the obovate leaves.*

M. conspícua, Salisb. YULAN. A small tree, with very large white flowers; petals 6–9, obovate; leaves pointed, downy when young. Half-hardy in N. States.

M. SOULANGEÀNA is probably a hybrid of this with M. obovata, more hardy, and the petals tinged with purple.

M. NORBERTIÀNA, a like hybrid, has darker flowers and slenderer habit.

M. SPECIÒSA, probably of like parentage, blooms a week later than M. Soulangeana, and has more durable, somewhat smaller and lighter colored flowers.

M. LÉNNEI, offshoot of M. obovata or hybrid with it, has very showy flowers, purple outside and pearl-colored within.

M. obovàta, Thunb. (or M. PURPÙREA). PURPLE M. A shrub (5° high), the showy flowers pink-purple outside, white within; leaves dark green, tapering gradually to petiole; petals 9, obovate. Japan, hardy N.

M. stellàta, Maxim. (or M. HALLIÀNA). A small tree; flowers white; petals about 15, linear-oblong; leaves varying to elliptic. Japan.

M. Kòbus, DC. (or M. THÚRBERI), is a small bushy tree, with leaves broadest at the top and green below; and very early, blush-white, fragrant flowers. Japan.

3. CERCIDIPHÝLLUM. (*Cercis-leaved*, from the resemblance of the foliage to that of the Red Bud.) Two large trees in Japan, one of which is now becoming popular in this country as an ornamental tree.

C. Japónicum, Sieb. & Zucc. Leaves round heart-shaped, or somewhat kidney-shaped, with 3–5 main veins, crenate, glaucous beneath. Tree fastigiate in shape.

4. ILLÍCIUM, STAR ANISE. (Latin: *to entice.*) Shrubs, aromatic, especially the bark and pods, with evergreen oblong leaves.

I. Floridànum, Ellis. Leaves oblong-lanceolate; petals 20–30, narrow widely spreading, dark purple, the flowers about 1′ in diameter. Shrub 6°–10°, far S.

I. parviflòrum, Michx., S., sometimes cult., has lanceolate leaves, 6–12, ovate or roundish, yellow petals, and smaller flowers.

5. SCHIZÁNDRA. (Greek: *cut-stamens.*)

S. coccínea, Michx., a twining shrub of S. States, scarcely aromatic, with thin ovate or oblong, alternate, deciduous leaves, and small crimson-purple flowers in spring.

III ANONACEÆ, CUSTARD APPLE FAMILY.

Trees or shrubs, with 3 sepals and 6 petals in 2 sets, each set valvate in the bud, and many short stamens on the receptacle, surrounding several pistils, which ripen into pulpy fruits containing large and flat bony seeds. Embryo small; the albumen which forms the bulk of the kernel appears as if cut up into small pieces. No stipules.

1 **ASÍMINA**, PAPAW of U. S. (From the Indian name, *assimin.*) Petals greenish or yellowish, becoming dark purple as they enlarge; the 3 inner small. Pistils few in the center of the head of anthers, making one or more large, oblong, pulpy fruits, sweet and edible. Flowers solitary, in early spring.

A. trílоba, Dunal. COMMON PAPAW. Leaves obovate-lanceolate, acuminate; flower 1′–1½′ wide; fruit yellowish, 3′–6′ long. A shrub or small tree; wild W. and S., and sometimes planted.

A. parviflòra, Dunal. SMALL-FLOWERED P. Leaves oblong-obovate, abruptly pointed; petals greenish-purple, twice as long as sepals; flower ½′ wide; fruit few-seeded. Shrub 2°–5° high. Fla. to N. C. and W.

IV. MENISPERMACEÆ, MOONSEED FAMILY.

Woody twiners, with small dicœcious flowers, their sepals and petals much alike, and one before the other (usually 6 petals before as many sepals); as many or 2–3 times as many stamens; and 2–6 pistils, ripening into 1-seeded little stone-fruits or drupes; the stone curved, commonly into a wrinkled or ridged ring. Leaves palmate or peltate; no stipules.

1. COCCULUS. Sepals, petals, and stamens each 6. Pistils 3–6.
2. MENISPERMUM. Sepals and petals 6–8. Pistils 2–4 in fertile flowers. Stamens, in sterile flowers, 12 or more. (Lessons, Figs. 231, 232, 296.)
3. CALYCOCARPUM. Petals 0. Sepals 6, petal-like. Pistils 3. Stamens in sterile flowers, 12.

1. **CÓCCULUS.** (Latin: *a little berry.*) Flowers in axillary clusters.

C. Carolìnus, DC. CAROLINA C. Somewhat downy; leaves ovate or heart-shaped, entire or sinuate-lobed; flowers greenish in summer; fruits red, as large as peas. From Virginia, S. and W.

2. **MENISPÉRMUM**, MOONSEED. (Greek: *moon, seed.*) Stamens as long as sepals; anthers 4-celled; drupe globular, with a crescent or ring-like wrinkled stone; flowers in axillary panicles.

M. Canadénse, Linn. Almost smooth; leaves peltate near the edge; flowers white in late summer; fruits black, looking like small grapes.

3. **CALYCOCÁRPUM**, CUPSEED. (Greek: *cup, fruit.*) Anthers 2-celled; flowers greenish-white in long racemose panicles.

C. Lyòni, Nutt. Climbing high; leaves large, thin, 3–5-lobed, cordate at base; fruit globular, 1′ diameter, black. Ky. and S. Ill. to Kans. and S.

V. BERBERIDACEÆ, BARBERRY FAMILY.

Flowers perfect, a petal before each sepal, and a stamen before each petal, anthers opening lengthwise or by a pair of valves like trap-doors, hinged at the top (Lessons, p. 103, Fig. 308), pistil single, simple. (But No. 1 has monœcious apetalous 3-sepaled flowers; No. 7 has numerous stamens; 6 and 7 have more petals than sepals.) Commonly bracts or outer sepals behind the true ones. All blossom in spring or early summer.

* *Woody twiner; flowers imperfect; berry many-seeded.*

1. AKEBIA. Flowers purple in few-flowered axillary racemes; petals 0; leaves digitate, of about 5 leaflets.

* * *Woody, erect; flowers perfect; berry few-seeded.*

2. BERBERIS. Flowers yellow or reddish tinted, in racemes; petals with two deep colored spots at the base. Leaves simple, or simply pinnate. Wood and inner bark yellow. Leaves with sharp, bristly or spiny teeth.
3. NANDINA. Flowers white, in panicles; anthers opening lengthwise. Leaves twice or thrice pinnate.

* * * *Perennial herbs.*

\+ *With* 1 *to* 3 *twice or thrice ternately compound leaves.*

4. EPIMEDIUM. Stamens 4. Petals 4 hollow spurs or hoods. Pod several-seeded. Leaflets with bristly teeth.
5. CAULOPHYLLUM. Stamens 6. Petals 6 broad and thickish bodies much shorter than the sepals. Ovary bursting or disappearing early, leaving the two ovules to develop into naked, berry-like, or rather drupe-like, spherical seeds on thick stalks.

\+ \+ *With simply* 2-9-*parted leaves, and solitary white flowers; sepals falling when the blossom opens. Seeds numerous, parictal. Pistils rarely more than one.*

6. JEFFERSONIA. Flower on a scape, rather preceding the 2-parted root-leaves. Petals (oblong) and stamens mostly 8. Fruit an ovate pod, opening by a cross-line half-way round, the top forming a conical lid. Seeds with an aril on one side.
7. PODOPHYLLUM. Flower in the fork between the two peltate 5–9-parted leaves; root-leaf single and peltate in the middle, umbrella-like. Petals 6–9, large and broad. Stamens usually 12–18. Fruit an oval, large, and sweet, edible berry; the seeds imbedded in the pulp of the large parietal placenta.

1. AKÈBIA. (Japanese: *Akebi.*) Flowers 3-sepaled, monœcious, the ♂ with 6 stamens and the ♀ with 3–9 carpels, ripening (only occasionally) into oblong, purplish, mottled berries (4′–6′), which split open, disclosing the black seeds.

A. quinàta, Decne. Leaflets 5, oval or obovate, notched at end, nearly or quite evergreen. An excellent hardy climber. Flowers, spring. Japan.

2. BÉRBERIS, BARBERRY. (Medieval Latin name.) The 2 sections have sometimes been regarded as distinct genera. (Lessons, Fig. 308.)

§ 1. True Barberry, *with apparently simple (really compound with 1 leaflet as shown by the joint in the short petiole) leaves clustered in the axil of branched spines.*

* *Flowers in axillary racemes; leaves bristly or spiny-toothed, not pinnate.*

B. vulgàris, Linn. Common B. A shrub with drooping, many-flowered racemes, and entire petals, and oblong, red, and sour berries; leaves obovate-oblong. The triple or multiple spines answer to leaves of the shoot of the previous season. (Lessons, p. 63, Fig. 171.) Naturalized in New Eng., planted and occasionally spontaneous elsewhere. There are cult. forms with fruits of divers colors and purple foliage.

B. Canadénsis, Pursh., wild in mountains from Virginia, S., is a low bush, with few-flowered racemes; repandly-toothed and less bristly leaves; petals notched at the top; and oval red berries. Probably not in commercial cult., the plant sold under this name being B. vulgaris.

* * *Flowers solitary or in pairs; leaves entire.*

B. Thunbérgii, DC. A low Japanese shrub; leaves ½′–1′ long; flowers on slender stalks, hardly longer than the small obovate leaves; sepals red, and petals often tinged with red; berries bright red. Foliage becomes red in fall.

§ 2. Mahonia, *with pinnate, evergreen leaves and clustered racemes of early spring flowers; berries blue or black with a bloom. Planted for ornament.*

* *Leaflets broad or rounded.*

B. Aquifòlium, Pursh. Holly B. or Mahonia from Oregon, etc., rises to 3°–4° high; leaflets ovate to oblong-taper-pointed, 5–9, shining, finely reticulated.

B. rèpens, Lindl. Creeping or Low M., Oregon Grape, is more hardy, rises only 1° or less, and has ovate, acute (not taper-pointed), usually fewer, pale or glaucous leaflets. Rocky Mountains.

B. nervòsa, Pursh. (or B. glumàcea). Has husk-like, long, and pointed bud-scales at the end of the stems, which rise only a few inches above the ground; leaflets 11–21, along the strongly jointed stalk, lance-ovate, several-ribbed from the base. Also from Oregon.

* * *Leaflets distinctly oblong or lanceolate.*

B. Nepalénsis, Spreng. (B. Japónica of gardens). Tall, rising fully 6° high, the rigid leaflets (5–25) obovate-oblong and repand-toothed, with only 3 or 4 strong spiny teeth on each side. India to Japan.

B. Fortùnei, Lindl. A dwarf species from China, the foliage turning red in the fall; leaflets 5–9, narrowly lanceolate and acuminate, with numerous shallow spiny teeth.

3. NANDÌNA. (From the Japanese name.) A single species.

N. doméstica, Thunb. Cult. in cool greenhouses, etc., from Japan; very compound large leaves; the panicle of globular red berries of the size of peas, more ornamental than the blossoms.

4. EPIMÈDIUM, BARRENWORT. (Old Greek name of uncertain meaning.) Hardy. 2ℓ Low herbs, with neat foliage; cult. for ornament; petals 4 hollow spurs or hoods; pods several-seeded.

E. alpìnum, Linn., odd-looking small flowers in panicles, the yellow petals not larger than the reddish sepals. Cent. Eu.

E. macránthum, Morr. & Decne. LARGE-FLOWERED B., with similar foliage, has large white flowers with very long-spurred petals. Japan. Several garden varieties are cult.

5. CAULOPHÝLLUM, BLUE COHOSH, PAPPOOSE ROOT. (Greek: *stem, leaf;* the stem seeming to form a stalk for the great leaf.) A single species. 2

C. thalictroìdes, Michx., with usually only 1 stem-leaf, and that close to the top of the naked stem, and thrice ternate, but, having no common petiole, it looks like 3 leaves; and there is a larger and more compound radical leaf, with a long petiole. Albumen horny, the integument forming a thin blue pulp. Glabrous (glaucous while young) from thick, knotty, matted rootstocks. In rich woods, commoner W.

6. JEFFERSÒNIA, TWINLEAF. (For *Thomas Jefferson.*) 2

J. diphýlla, Pers., sometimes called RHEUMATISM ROOT. Rich woods, W. and S., sometimes cult.; the pretty white flower and the leaves both long-stalked from the ground, appearing in early spring.

7. PODOPHÝLLUM, MAY APPLE, or MANDRAKE. (Greek: *foot, leaf*, the 5–7-parted leaf likened to a webbed-foot.) (Lessons, Fig. 326.) 2

P. peltàtum, Linn. Flower white, 1½′ broad; fruit ovoid, 1′–2′ long, slightly acid, edible; but the leaves and long running root-stocks drastic and poisonous. Rich woods, common.

VI. NYMPHÆACEÆ, WATER LILY FAMILY.

Aquatic, perennial herbs, from strong, horizontal rootstocks, with the leaves which float on the surface of the water or rise above it mostly peltate or roundish heart-shaped (dissected and immersed in No. 1), their margins in-rolled in the bud, long-petioled; axillary 1-flowered peduncles; sepals and petals hardly ever 5, the latter usually numerous and imbricated in many rows. The genera differ so widely in their botanical characters that they must be described separately. One of them is the famous Amazon Water Lily, VICTÒRIA RÈGIA, with floating leaves, 3 feet or more in diameter, and the magnificent flowers almost in proportion; while the dull flowers of Water-Shield are only half an inch long.

§ 1. *Sepals and petals each* 3 *or* 4. *Stamens and pistils* 18 *or less, the latter* 1–3*-seeded. Flowers small.*

1. CABOMBA. Sepals and petals 3, the latter oval and short-clawed. Stamens 3–6, with extrorse anthers. Pistils 2–4, with 3 pendulous ovules. Immersed slender plants, with mostly opposite or verticillate, finely dissected leaves, or a few floating, linear, oblong, and peltate ones. Flowers single, on long axillary peduncles.

2. BRASENIA. Sepals and petals each 3 or 4, narrow, and much alike, dull purple, linear. Stamens 12–18, with innate anthers. Pistils 4–18, forming indehiscent, 1–3-seeded pods. All the parts separate and persistent. Ovules commonly on the dorsal suture. Embryo, etc., as in Water Lily.

§ 2. *Sepals and petals numerous, in several rows and passing into each other. Stamens many. Pistils several, each sunken in the obconical and nearly flat-topped receptacle, the imbedded nut-like fruits appearing like seeds in separate open cells.*

3. NELUMBO. Upper part of the receptacle enlarged into a top-shaped body, bearing a dozen or more ovaries, each tipped with a flat stigma and separately immersed in as many hollows. (Lessons, p. 113, Fig. 362.) In fruit these form 1-seeded nuts, resembling small acorns. The whole kernel of the seed is embryo, a pair of fleshy and farinaceous cotyledons inclosing a plumule of 2 or 3 rudimentary green leaves.

§ 3. *Sepals* 4–6. *Petals and stamens numerous in many rows. Pistil* 1, *compound.*

4. NYMPHÆA. Sepals 4, green outside. Petals numerous, many times 4, passing somewhat gradually into the numerous stamens (Lessons, p. 84, Fig. 228); both organs grow attached to the globular many-celled ovary, the former to its sides which they cover, the latter borne on its depressed summit. Around a little knob at the top of the ovary the numerous stigmas radiate as in a poppy-head, ending in long and narrow incurved lobes. Fruit like the ovary enlarged, still covered by the decaying persistent bases of the petals; numerous seeds cover the partitions. Ripe seeds each in an arillus, or bag, open at the top. (Lessons, p. 126, Fig. 418.) Embryo, like that of Nelumbo on a very small scale, but inclosed in a bag, and at the end of the kernel, the rest of which is mealy albumen.

5. NUPHAR. Sepals usually 6 or 5, partly green outside. Petals many small and thickish bodies inserted under the ovary along with the very numerous short stamens. Ovary naked, truncate at the top, which is many-rayed by stigmas, fleshy in fruit; the internal structure as in Nymphæa, only there is no arillus to the seeds.

1. CABÓMBA. (Name aboriginal?)

C. Caroliniàna, Gray. Flowers 6″–8″ broad on long axillary stalks, with yellow spots at base of petals. Ponds, S. Ill. and S.

2. BRASÈNIA, WATER SHIELD. (Name unexplained.) One species.

B. peltàta, Pursh. In still, rather deep water; stems rising to the surface, slender; leaves 2′–3′ long, long-petioled; flowers small, produced all summer.

3. NELÚMBO. (The Ceylonese name for N. Indica.)

N. lùtea, Pers. YELLOW N. or WATER CHINQUAPIN. S. Conn. (introduced by Indians perhaps) to Lake Ont., Minn., E. Neb., and S. Flower pale dull yellow, 5′–8′ across; anthers hook-tipped; leaf and flower-stalks sparsely warty roughened. The leaves are very large (1°–2° across) and centrally peltate, with an ascending limb, and raised high out of the water.

N. Indica, Pers. (or NELUMBIUM SPECIÒSUM), FALSE LOTUS, SACRED BEAN of the Orient, now commonly cult., has pink flowers and blunt anthers, and the high flower and leaf-stalks studded with prickly warts.

4. NYMPHÆA, WATER LILY, POND LILY. (Dedicated to the water nymphs.) Long prostrate rootstocks, often as thick as one's arm, send up floating leaves (rounded and with a narrow cleft nearly or quite to the petiole) and large handsome flowers, produced all summer; these close in the afternoon; the fruit ripens under water.

* *White-flowered; native in N. States.*

N. odoràta, Ait. WHITE W. Flower very sweet-scented, white, or sometimes pinkish, rarely pink-red, variable in size, 2′–6′ broad; petals obtuse; leaves 2′–9′ broad; seeds oblong; rootstocks with few and persistent branches. Common in still or slow water, especially E.

N. renifórmis, DC. (or N. TUBERÒSA). Flower nearly scentless (its faint odor like that of apples), pure white, 4′–9′ in diameter; petals proportionately broader and blunter; leaves 8′–15′ wide; seeds almost globular; rootstock bearing copious tubers like "artichokes," attached by a narrow neck and spontaneously separating. W. N. Y. and Penn., Mich. and W., probably also in S. States.

* * *Flowers colored; exotic or southern.*

N. stellàta, Willd. (or N. CŒRÙLEA), BLUE W., cult. in aquaria; a tender species, with crenate-toothed leaves, and blue or bluish sweet-scented flowers, the petals few, narrow, and acute. Trop. Africa, India, etc.

N. ZANZIBARENSIS of gardens is a form of this, with intense blue flowers, and free blooming habit.

N. Lòtus, Linn. EGYPTIAN LOTUS, an Old World tropical species, has large red or whitish flowers, with red-margined sepals, and peltate, sharply serrate leaves which are pubescent below. N. RÙBRA and N. DEVONIÉNSIS are forms of it; and from the latter garden form the variety known as N. STURTEVÁNTII originated.

N. flàva, Leitn. YELLOW W. Leaves broadly oval with wavy margins, the lobes at base of notch not pointed; flowers bright, light yellow; petals sub-acute. Florida.

5. **NÙPHAR**, YELLOW POND LILY, SPATTER-DOCK. (Arabic name?) Rootstock, etc., as in Nymphæa; leaves often rising out of water; flowers by no means showy, yellow, sometimes purplish-tinged, produced all summer; fruit ripening above water.

N. ádvena, Ait.f. Sepals 6 or more, unequal; petals truncate, shorter than the stamens and resembling them; stigma 12–24-rayed; ovary and fruit not contracted above into a neck; the thickish leaves (6′–12′ long) rounded or ovate-oblong.

Var. **mìnus**, Morong, has smaller leaves (3′–8′ long), spatulate petals, stigmas 9–13-rayed; fruit contracted above. Probably a hybrid between this species and the next. N. Vt. to Mich. and Pa.

N. Kalmiànum, Ait., has the floating leaves only 2′–4′ long, submersed leaves thin, round, kidney-shaped; petals spatulate or obovate; stigmas 7–10-rayed; fruit with a short neck. Me. to Penn., Minn., and N.

N. sagittifòlium, Pursh. ARROW-LEAVED N. Leaves sagittate, narrowly oblong to oblanceolate, obtuse (1° by 2′). This and the last produce their earlier leaves under water and very thin. S. Ind. and Ill. and S. E.

VII. SARRACENIACEÆ, PITCHER PLANT FAMILY.

Bog plants with hollow pitcher-form or trumpet-shaped leaves; flowers with numerous hypogynous stamens. Only 1 genus in the E. U. S. 2. There are many hybrids of the following species in cult.:—

1. **SARRACENIA**. (For *Dr. Sarrasin* of Quebec.) SIDESADDLE FLOWER. Leaves yellowish green or purplish, all radical from a perennial root, winged down the inner side, open at the top, where there is a sort of arching blade or hood; scape tall, naked, bearing a single, large, nodding flower in early summer; sepals 5, with 3 bractlets at the base, colored, persistent; petals 5; style with an umbrella-shaped, 5-angled top, a hooked stigma under each angle; ovary 5-celled; pods many-seeded, rough-warty. (Lessons, Fig. 174.)

* *Flower purple.*

+ *Leaves ascending or reclined, short, wing broad.*

S. purpùrea, Linn. PITCHER PLANT. Leaves with an erect round-heart-shaped hood and a broad side-wing, purple-veiny; flower deep purple or greenish tinged; petals fiddle-shaped, arched over the style. Common in bogs N.

S. psittacìna, Michx. PARROT PITCHER PLANT of S. States, and cult. Leaves short and spreading, with a narrow tube, a broad wing, and an inflated globular hood, which is incurved over the mouth of the tube, spotted with white.

+ + *Leaves erect, with long and narrow trumpet-shaped tube, the wing narrow.*

S. rùbra, Walt. RED-FLOWERED TRUMPET LEAF of S. States; cult. in greenhouses. Leaves slender, a foot long, with an erect, ovate, pointed hood; flower crimson-purple.

S. Drummóndii, Croom. GREAT TRUMPET LEAF of Florida; sometimes cult. Leaves much like the last, but 2° or 3° long, upper part of the tube and the roundish erect hood variegated and purple-veiny; and the deep-purple flower very large.

* * *Flower yellow.*

S. variolàris, Michx. SPOTTED TRUMPET LEAF, S. States. Leaves erect, 6′–12′ long, white-spotted above, longer than the scape, with a broad wing, and an ovate hood arching over the orifice; flower 2′ wide.

S. flàva, Linn. YELLOW TRUMPET LEAF of S. States; cult. more commonly than the rest, as a curiosity, and almost hardy N. Leaves 2° long, erect, yellowish, or purple-veiny, with a narrow wing and an erect roundish, but pointed hood; scape tall as the leaves; flower 4′–5′ wide.

Darlingtònia Califórnica, Torr., occasionally cult., may be known by the reddish or yellowish two-cleft appendage hanging at the mouth of the leaves which looks downward.

VIII. PAPAVERACEÆ, POPPY FAMILY.

Herbs with regular flowers, a calyx mostly of 2 sepals which fall when the blossom opens, petals twice or 3–5 times as many, numerous free stamens and a 1-celled ovary, with 2 or more parietal placentæ. Fruit a pod, many-seeded. Juice usually milky or colored, and narcotic, as in Poppy (opium), or acrid. (No. 4. has watery juice, with the odor of muriatic acid, and the calyx like a cap or lid; No. 1 has no petals and few seeds.)

* *Petals none; flowers in panicles; flower-buds drooping.*

1. BOCCONIA. Sepals 2, colored. Stigma 2-lobed. Pod few-seeded. Juice reddish.

* * *Petals present. Flowers not panicled, the buds either erect or nodding.*

+ *Pod strictly 1-celled, opening more or less completely by valves.*

++ *Flower-bud erect.*

2. SANGUINARIA. Sepals 2; but the petals 8–12. Stigma 2-lobed, on a short style. Pod oblong, with 2 placentæ. Juice orange-red.

3. ARGEMONE. Stigma 3–6-lobed, almost sessile. Sepals and oblong pod prickly; the latter opening by valves from the top, leaving the thread-like placentæ between. Juice yellow.

4. ESCHSCHOLTZIA. Sepals united into a pointed cap which falls off entire. Receptacle or end of the flower-stalk dilated into a top-shaped body, often with a spreading rim. Stigmas 4–6, spreading, unequal; but the placentæ only 2. Pod long and slender, grooved. Juice colorless.

++ ++ *Flower-bud generally nodding.*

5. STYLOPHORUM. Stigma 3–4-lobed, raised on a style. Pod ovoid, bristly, opening from the top into 3 or 4 valves, leaving the thread-like placentæ between them. Juice yellow.

6. CHELIDONIUM. Stigma 2-lobed, almost sessile. Pod linear, with 2 placentæ, splitting from below into 2 valves. Juice orange.

+ + *Pod becoming 2–∞-celled.*

++ *True herbs.*

7. GLAUCIUM. Stigma 2-lobed; style 0. Pod rough, linear, 2-celled by a spongy false partition. Sepals 2. Petals 4. Juice yellow.

8. PAPAVER. Stigmas united into a many-rayed circular body which is closely sessile on the ovary. Pod globular or oblong, imperfectly many-celled by the projecting placentæ which are covered with numberless seeds, opening only by pores or chinks at the top. Juice milky.

++ ++ *More or less woody.*

9. ROMNEYA. Stigmas many, free; the ovary setose, and more or less completely several-celled by the intrusion of the ∞-ovuled placentæ, but becoming completely 7–11-celled and dehiscing to the middle. Sepals 3, with a broad, thin, dorsal wing. Petals 6, white. Stamens numerous, with slender filaments. Juice colorless.

1. BOCCÒNIA. (Named for *Bocconi*, an Italian botanist.) 2

B. cordàta, Willd., from China, is a tall herb with leafy stems and round-cordate, lobed leaves which are thick, veiny, and glaucous, and long panicles of whitish or rose flowers in summer.

2. SANGUINÀRIA, BLOODROOT. (Name from the blood-red juice.) 2

S. Canadénsis, Linn., the only species; common in rich woods. The thick red rootstock in early spring sends up a rounded-reniform and palmate-lobed, veiny leaf, wrapped around a flower-bud; as the leaf comes out of ground and opens, the scape lengthens, and carries up the handsome flower, from which the sepals soon fall.

3. ARGEMÒNE, PRICKLY POPPY. (Greek: a disease of the eye, for which a plant called by this name was a supposed remedy.)

A. grandiflòra, Sweet. Hardy 2 Petals white, 1½′–2′ long; stems, sepals, and pod smooth and unarmed (the latter rarely with a few stiff bristles). Mexico.

A. Mexicàna, Linn. MEXICAN P. Stems, leaves, sepals, and pod prickly; petals dull yellow or yellowish, 1′ or less long in summer. Var. ALBIFLÒRA has the flower larger, sometimes very large; white; 1°–2° high. Waste places S. and gardens. Cult. for ornament. ①

4. ESCHSCHÓLTZIA. (Named for one of the discoverers, *Eschscholtz.*) ① 2

E. Californica, Cham. CALIFORNIAN POPPY. Common in gardens; with pale, dissected leaves, and long-peduncled large flowers, remarkable for the top-shaped dilatation at the base of the flower, on which the extinguisher-shaped calyx rests; this is forced off whole by the opening petals.

The latter are bright orange-yellow, and the top of the receptacle is broad-rimmed. Var. *Douglásii* wants this rim, and its petals are pure yellow, or sometimes white; but the sorts are much mixed in the gardens; and there are smaller varieties under different names.

5. STYLÓPHORUM, CELANDINE POPPY. (Greek: *style-bearing;* a distinctive character.) 2

S. diphýllum, Nutt. Low, with stems naked below, with usually 2 opposite leaves above; leaves whitish beneath, pinnately parted into 5–7 sinuate-lobed segments; flowers few in umbels, 2′ broad. Damp woods, W. Penn. to Wisc. and Tenn. May.

6. CHELIDÒNIUM, CELANDINE. (Greek: *the swallow;* its flowers appearing with the swallows.) ②

C. màjus, Linn. 1°–4° high; branching, with pinnate or twice pinnatifid and toothed or cut leaves, and small yellow flowers in a sort of umbel, all summer; old gardens and moist waste places. Eu.

7. GLAÙCIUM, HORN POPPY. (Greek: referring to the glaucous herbage.) ① ②

G. lùteum, Scop. Stem 1°–5° high, stout, glaucous, and hairy; leaves thickish, lower bipinnatifid, upper sinuate-lobed, clasping; flowers solitary, terminal, golden yellow; pod 6′–1° long. Cult. and sparing nat. eastward. Eu.

8. PAPÀVER, POPPY. (Name obscure, ancient.)

* *Annuals, flowering in summer; cult. and weeds of cultivation.*

P. somníferum, Linn. OPIUM POPPY. Cult. for ornament from the Old World (especially double-flowered varieties), and for medical uses. Smooth, glaucous, with clasping and wavy leaves, and white or purple flowers, which are often much doubled and fringed. Pod large, short-oblong.

P. Rhœas, Linn. CORN POPPY of Eu. Low, bristly, with almost pinnate leaves, and deep red or scarlet flowers with a dark eye, or, when double, of various colors; pod small, obovate.

* * *Perennial; cult. for ornament; flowering in spring.*

P. orientàle, Linn. ORIENTAL P. Rough-hairy, with tall flower-stalks, almost pinnate leaves, and a very large, deep-red flower, under which are usually some leafy persistent bracts. Var. BRACTEÀTUM has these bracts larger, petals still larger and deeper red, with a dark spot at the base.

P. nudicaùle, Linn. DWARF OR ICELAND P. Rough-hairy, leaves all radical, oblong-spatulate or obovate in outline, pinnatifid; petals yellow, orange, or white; flower single on a hairy scape 6′–2° high. A widely distributed alpine species.

9. RÓMNEYA. (Named for *T. Romney Robinson*, an Irish astronomer.) A single species.

R. Còulteri, Harvey. Smooth shrub, 6°–8° high of S. California, or nearly herbaceous in cultivation E.; leaves petioled, glaucous, the lower ones pinnatifid, upper ones pinnately cut or toothed; flowers very showy, 4′–6′ across.

IX. FUMARIACEÆ, FUMITORY FAMILY.

Sepals 2, scale-like; petals 4, much larger, also irregular and closed, the 2 outer with spreading tips and 1 or both spurred or saccate at base, the 2 inner and smaller petals united by their spoon-shaped tips, which inclose the anthers of the 6 stamens in 2 sets along with the stigma; the middle anther of each set is 2-celled, the lateral ones being 1-celled. Delicate or tender and very smooth herbs, with colorless and inert juice, and much dissected or compound leaves.

* *Corolla heart-shaped or 2-spurred at base; pod several-seeded.*

1. DICENTRA. Petals slightly cohering with each other. Seeds crested.
2. ADLUMIA. Petals all permanently united into one slightly heart-shaped body, which incloses the small pod. Seeds crestless. Climbing by the very compound leaves.

* * *Corolla with only one petal spurred at base.*

3. CORYDALIS. Ovary and pod slender, several-seeded. Seeds crested.
4. FUMARIA. Ovary and small closed fruit globular, 1-seeded.

1. DICÉNTRA (meaning 2-*spurred* in Greek). Often named DICLYTRA or DIÉLYTRA. ♃ Flowers in spring.

* *American species, low, with delicate decompound leaves and few-flowered scapes sent up from the ground in early spring.*

+ *Racemes simple, few-flowered; divisions of leaves linear.*

D. Cucullària, DC. DUTCHMAN'S BREECHES. Common in leaf mold in woods N. Foliage and flowers from a sort of granular-scaly bulb; corolla white, tipped with yellow, with the 2 diverging spurs at the base longer than the pedicel, the inner petals minutely crested.

D. Canadénsis, DC. CANADIAN D. or SQUIRREL CORN. With the last N. Underground shoots bearing separate yellow grains, like Indian corn, in place of a scaly bulb; the corolla narrower and merely heart-shaped at base, white or delicately flesh-colored, sweet-scented; inner petals prominently crested at tip.

+ + *Racemes compound, although small, clustered; divisions of leaves broad-oblong.*

D. exímia, DC. A rare species in W. N. Y. and S. in Alleghanies, also cult., has reddish-purple, drooping, narrow flowers with short-hooked spurs; underground shoots scaly.

D. formòsa, DC., of the Pacific coast, also cult., has broader flowers than the last and spurs not hooked.

* * *Cultivated exotic, taller and coarser, leafy-stemmed, many-flowered.*

D. spectábilis, DC. SHOWY D. or BLEEDING HEART, very ornamental through spring and early summer, with ample Peony-like leaves, and long drooping racemes of bright pink-red (or white), heart-shaped flowers (1′ long) 1; the 2 small sepals fall off in the bud. China.

2. ADLÙMIA, ADLUMIA or CLIMBING FUMITORY. (Named for *John Adlum*, of Washington, D. C., one of the earliest cultivators of native grapes, and author of the first American book upon the subject.) ② A single species.

A. cirrhòsa, Raf. Wild in low, shady grounds, and cult., climbing over bushes to a height of 8°–12° by means of the slender, young leaf-stalks; leaves delicate and decompound; flowers flesh-colored in summer.

3. CORÝDALIS. (Greek name for the *crested lark.*) Our species are leafy-stemmed, ② wild in rocky places; flowers spring and summer.

* *Stem strict; flowers purplish or rose-color, with yellow tips.*

C. glaùca, Pursh. PALE CORYDALIS. Common, 6′–2° high, very glaucous; spur short, rounded; pods erect, slender, elongated.

* * *Stem ascending; flowers yellow.*

– *Outer petals wing-crested on the back; corolla pale yellow, 3″–4″ long.*

C. flávula, DC. YELLOWISH C. Pedicels slender, with conspicuous bracts; pods hanging or spreading; seeds sharp-edged, irregularly wrinkled; petal-crest toothed. From Penn. S. & W.

C. micrántha, Gray. Pedicels short; bracts small; petal-crest entire; pods ascending; seeds blunt-edged, smooth, and shining. N. C., Mo., Minn., and S.

– – *Outer petals merely keeled on the back, not crested; corolla golden yellow, ½′ long.*

C. aùrea, Willd. GOLDEN C. Low and spreading; petals with a spur ¼″ long; spreading or hanging pods, and smooth, blunt-edged seeds. From Vermont, W. and S.

A western var. (*occidentàlis*) has longer flowers, with spur as long as body.

4. FUMÀRIA, FUMITORY. (Latin: *fumus*, smoke.) ① Low. leafy-stemmed, with finely cut compound leaves.

F. officinàlis, Linn. COMMON F. A delicate, small weed, with a close spike of small, pinkish, crimson-tipped flowers, in summer. Occasional in old gardens, waste places, and dung-heaps.

X. CRUCIFERÆ, MUSTARD FAMILY.

Herbs, with watery juice, of a pungent taste (e.g. Horse-radish, Mustard, Water Cress, etc.); cruciferous flowers (of 4 sepals, 4 petals, with their upper part generally spreading above the calyx in the form of a cross); tetradynamous stamens (i.e. 6, 2 of them shorter than the other 4; rarely 4 or 2); a single 2-celled pistil with 2 parietal placentæ, forming in fruit a silique, or when short a silicle. (See Lessons, Figs. 235, 236, for the flower, Figs. 401–403 for the fruit, and Figs. 425–428 for the seed.) The embryo fills the whole seed, and has the radicle bent against the cotyledons. Flowers in racemes, which are at first short, like simple corymbs, but lengthen in fruiting; no bracts below the pedicels. The blossoms are all nearly alike throughout the family; so that the genera are mainly known by the fruit and seed, which are, therefore, indispensable and may usually be had before all the flowers have passed.

§ 1. *Fruit a true pod, opening lengthwise by two valves, which fall away and leave the thin, persistent partition when ripe.*

* *Pod flattened parallel to the partition; the seeds flat or flattish; seed-leaves edgewise to their stem.*

+ *Pod broadly oblong or oval, large and very flat; seeds 2–4 in each cell in 2 rows.*

1. LUNARIA. Seeds winged. Large pod stalked in the calyx. Flowers purple, rather large.

+ + *Pod oblong or linear; seeds in 1 row.*

++ *Valves nerveless.*

2. LEAVENWORTHIA. Stems scape-like, 1-few-flowered. Seeds winged. Small annuals.
3. DENTARIA. Stems naked below, 2–3-leaved above, from a horizontal, fleshy, scaly root-stock. Seeds wingless.
4. CARDAMINE. Stems leafy, from a fibrous root, or at least not from a scaly rootstock. Seeds wingless.

++ ++ *Valves with a prominent midrib.*

5. MATTHIOLA. Stigma deeply 2-lobed. Seeds as broad as the partition, winged. Flowers large and showy, white to purple.
6. ARABIS. Stigma only slightly, or not at all, 2-lobed. Seeds winged or margined.

+ + + *Pod linear, oblong, or even round-oval, but the seeds in 2 rows.* [See, also, *Arabis.*]

7. DRABA. Seeds wingless, numerous. Pods flat, various in shape. Flowers small and (in ours) white.
8. ALYSSUM. Seeds winged, 2–4. Pods flat, roundish. Flowers small, yellow or white.

* * *Pod globular, or cylindric, or 4-angled by the prominent mid-nerves; seeds wingless.* [*Matthiola* may be sought here.]

+ *Pod globular or cylindric.*

++ *Valves nerveless; cotyledons accumbent.* (Lessons, Figs. 425, 426.)

9. LESQUERELLA. Pod about 4-seeded. Low, hoary plants with mostly yellow, small flowers.
10. AUBRIETIA. Pod many-seeded. Stronger, hoary, with purple, rather large flowers.
11. NASTURTIUM. Pod many-seeded. Aquatic or marsh plants, hairy or smooth, and small yellow or white flowers.

++ ++ *Valves nerved; cotyledons incumbent.* (Lessons, Figs. 427, 428.)

12. CAMELINA. Pod turgid, obovate, or pear-shaped. Weed, usually in flax.

+ + *Pod linear.*

++ *Cotyledons accumbent.*

(11. NASTURTIUM.) Valves nerveless. Marsh or aquatic plants.

13. CHEIRANTHUS. Valves with a strong mid-nerve. Lateral sepals sac-like at base. Leaves entire and flowers showy.
14. BARBAREA. Valves with strong mid-nerve. Sepals nearly equal and alike. Leaves lyrate or pinnatifid.

++ ++ *Cotyledons incumbent.* (Lessons, Figs. 427, 428.)

= *Flowers purple or rose-colored, or, if white, large.*

15. HESPERIS. Stigma with 2 erect blunt lobes. Flowers pink-purple. Hairs glandular.
16. MALCOLMIA. Stigma with 2 pointed lobes. Hairs glandless.
17. THELYPODIUM. Stigma entire.

= = *Flowers yellow, or, if white, very small.*

18. ERYSIMUM. Stigma rather large and 2-lobed. Leaves simple.
19. SISYMBRIUM. Stigma small and entire. Leaves twice pinnatifid.

++++++ *Cotyledons conduplicate.*

20. BRASSICA. Pod more or less beaked. Flowers yellow.

* * * *Pod short, much flattened contrary to the narrow partition; the valves, therefore, deeply boat-shaped. Flowers white, small.*

\+ *Pod several or many-seeded.*

21. CAPSELLA. Pod triangular, or pyriform, with a notch at the top. Weeds.

\+ \+ *Pod with 2, or rarely more, seeds.*

\++ *Corolla regular and small.*

22. LEPIDIUM. Pod thin, smooth, and oval. Erect herbs.

23. SENEBIERA. Pod thickish and wrinkled, or warty-roughened. Diffuse or prostrate herbs.

\++ \++ *Corolla irregular, the petals very unequal.*

24. IBERIS. Pod scale-shaped, roundish, or ovate. Flowers white or purple in flat-topped, or sometimes elongated, clusters.

§ 2. *Fruit indehiscent, wing-like, 1-seeded.* [*Senebiera* may be sought here.]

25. ISATIS. Flowers yellow. Fruit 1-celled, 1-seeded, resembling a small samara or ash-fruit.

§ 3. *Fruit fleshy, or when ripe and dry corky, not opening by valves, 2-many-seeded.*

26. CAKILE. Fruit jointed in the middle; the 2 short joints 1-celled, 1-seeded. Seed oblong.

27. RAPHANUS. Fruit several-seeded, with pithy matter, or with constrictions between the spherical seeds.

1. LUNÀRIA, HONESTY or SATIN FLOWER. (Latin: *the moon*, from the silvery persistent partition of the pods.) ① ② ♃

L. annua, Linn. (or L. BIÉNNIS). COMMON HONESTY. Cultivated in old-fashioned places, for the singular large oval pods, of which the broad white partitions of satiny luster, remaining after the valves have fallen, are used for ornament; leaves somewhat heart-shaped; flowers large, pink-purple, in early summer. Eu.

L. rediviva, Linn. PERENNIAL HONESTY is a much rarer European sort, with oblong pods; seldom met with here.

2. LEAVENWÓRTHIA. (For the late *M. C. Leavenworth.*) Low winter annuals, with lyrate leaves.

L. Michaùxii, Torr. Leaves with 7–15 lobes; petals obtuse, purple, or nearly white, with yellowish claw; pods even. S. Ind. to Tenn. and Mo.

L. torulòsa, Gray, similar to the preceding, but with notched petals and knotty pods, grows in the barrens of Ky. and Tenn.

L. aùrea, Torr., has leaves with 4–7 lobes, petals as in the last, but pods even and flowers yellow. N. Ala. and W.

3. DENTÀRIA, TOOTHWORT. (Latin: *dens*, a tooth.) ♃ Low plants with handsome flowers in early spring.

D. diphýlla, Linn. TWO-LEAVED T., PEPPER ROOT, or CRINKLE ROOT. Rootstocks fleshy, long (5′–10′), and toothed, edible; stem-leaves 2, close together, each of 3 rhombic-ovate and toothed leaflets; root-leaf similar; flowers quite large, white, in spring. Rich woods, N.

D. heterophýlla, Nutt. Rootstocks near the surface, short, prominent, tubercled; stem-leaves of 3-petioled leaflets which are oblong-lanceolate to linear, entire or deeply crenate, rarely cut; flowers in late spring. Penn. to Ky. and S.

D. laciniàta, Muhl. Rootstock deep in ground, short, necklace-form, or constricted in 2 or 3 places, scarcely toothed; stem-leaves 3, often in a

whorl, each 3-parted into linear or lanceolate leaflets, which are cut or cleft into narrow teeth, or the lateral ones 2-lobed; flowers white or rosy in spring. Banks of streams, N.

4. **CARDAMÌNE**, BITTER CRESS. (Ancient Greek name.) 2ℓ Mostly attractive little plants of spring or early summer. (Lessons, Fig. 401.)

* *Leaves simple.* 2ℓ

C. rhomboídea, DC. Stems upright from a small tuber, simple, bearing rather large, white, or rose-purple flowers in spring; and leaves simple, angled, or sparingly toothed, the lowest rounded or heart-shaped, the upper ovate or oblong; seeds round-oval. In wet places northward.

C. rotundifòlia, Michx. MOUNTAIN WATER CRESS. Stems weak or decumbent, branching; root fibrous; leaves (all much alike) roundish, angled; flowers white; seeds oval-oblong. N. J. to Ky. and S. in the mountains.

* * *Leaves pinnate; flowers showy.* 2ℓ

C. praténsis, Linn. CUCKOOFLOWER or LADIES' SMOCK. Stem ascending from a short perennial rootstock; leaves with rounded and stalked, entire, small leaflets; flowers in spring, pink or white. Wild, but rare, in bogs at the N. A double-flowered variety is an old-fashioned plant in gardens.

* * * *Leaves pinnate; flowers small, white.* ① *or* ②

C. hirsùta, Linn. SMALL B. A low and branching insignificant herb, usually not hairy; root slender, fibrous; leaflets angled or toothed; pods narrow, upright. Wet places. Common and variable; flowers spring and summer.

5. **MATTHÌOLA**, STOCK or GILLYFLOWER. (Named for the early naturalist, *Matthioli*.) Cult. garden or house plants, from Eu., hoary-leaved, much prized for their handsome and fragrant, pretty, large flowers, of which there are very double and showy varieties. Colors various, pure, or variegated, through crimson, purple, rose, and white.

M. incàna, Br. COMMON STOCK. 2ℓ ② in cultivation. Stout stem becoming almost woody; not hardy at the N. The source of the Brompton and Queen stocks. Flowers many colors.

M. ánnua, Sweet. TEN WEEKS and INTERMEDIATE STOCKS. An herbaceous plant, probably only a form of the last. ①

6. **ÁRABIS**, ROCK CRESS. (Name from *Arabia*.) Flowers spring and summer. Leaves mostly simple and undivided.

§ 1. *Seeds in* 1 *row in each cell, orbicular, somewhat winged.*

* *Flowers not showy, white or whitish; native.* ① ②

+– *Low, spreading; leaves pinnately parted.*

A. Ludoviciàna, Meyer. Nearly smooth; pedicels very short. Open grounds, Va. to Mo. and S.

+– +– *Erect, leafy-stemmed; leaves simple; the slender pods ascending or erect; seeds almost wingless.*

A. pàtens, Sulliv. Downy, 1°–2° high, stem-leaves, oblong-ovate with a clasping base; pedicels spreading; pods spreading or ascending, tipped with a distinct style. Penn. to Ohio and S.

A. hirsùta, Scop. HAIRY R. Mostly rough hairy, 1°–2° high; stem-leaves many and sagittate; pedicels of the small greenish-white flowers and the pods strictly erect; style almost 0. Rocks, N.

+ + + *Erect, leafy-stemmed 1°–3° high; leaves simple; pods 3′–4′ long, recurved or hanging; seeds broadly winged.*

A. lævigàta, Poir. SMOOTH R. Smooth and glaucous; upper leaves sagittate and clasping; petals scarcely as long as calyx; pods very narrow and not very flat, recurving.

A. Canadénsis, Linn. SICKLE POD. Stem-leaves pointed at both ends, pubescent; petals twice as long as calyx; pods scythe-shaped, very flat, hanging.

* * *Flowers showy, white in spring; garden species from Eu.* 2

A. alpìna, Linn. ALPINE R. Low and tufted, hairy or soft-downy; lower leaves oblong-obovate, sharply toothed; petals gradually narrowed to a claw.

A. álbida, Stev. Leaves sparingly toothed; petals abruptly narrowed into a claw.

§ 2. *Seeds in 2 more or less distinct rows, at least when young; strict and very leafy-stemmed.*

A. perfoliàta, Lam. TOWER MUSTARD. 2°–4° high, glaucous; petals yellowish-white, little longer than calyx; pods and pedicels strictly erect. N. Eng. to Minn., N. and W. ②

A. confínis, Wats. Scarcely glaucous; petals white or rosy, twice length of calyx; pods loosely erect to spreading. Canada, S. to Conn., W. to Minn. and Ill. ②

§ 3. *Seeds in 1 row, very small, wingless.*

A. lyràta, Linn. Low R. Delicate, low, nearly smooth, root-leaves lyrate; stem-leaves few and narrow with a tapering base; bright white petals rather conspicuous; pods slender, spreading. ② 2

A. dentàta, Torr. & Gray. Roughish pubescent; root-leaves oblong, toothed; stem-leaves half-clasping and eared at base; pods widely spreading. N. Y. to Mich., Minn. and S. ②

7. DRÀBA, WHITLOW GRASS. (Greek: the name of some cress — meaning unknown.) Low herbs, mostly with white flowers; pods round-oval, oblong or linear, flat. Flowers early spring. Winter annuals.

* *Pods longer than their pedicels; leaves obovate.*

D. Caroliniàna, Walt. Leaves entire, hairy, on a very short stem, bearing a short raceme or corymb on as cape-like peduncle 1′–4′ high; petals not notched; pods broadly linear, smooth; in sandy waste places.

D. cuneifòlia, Nutt. Leaves toothed; raceme elongated (1′–3′) in fruit; petals notched; pods oblong-linear, hairy. Ill. to E. Kan. and S.

D. vérna, Linn. Leaves all radical, oblong or lanceolate; scape 1′–3′ high; petals white, 2-cleft; pods oval or oblong; in sandy waste places. Introd. from Eu.

* * *Pods equaling or shorter than their pedicels; leaves oblong to lanceolate.*

D. brachycárpa, Nutt. Stems leafy, 2′–4′ high; flowers yellow; petals minute or 0; pods smooth. Va., W.

8. ALÝSSUM. (Greek name of a plant.) Cult. for ornament.

A. marítimum, Lam. SWEET ALYSSUM. Spreading, green or slightly hoary; leaves lanceolate or linear entire, tapering at the base; flowers

small, white, honey-scented, in at length elongated racemes, the round little pods with a single seed in each cell. A variety much used for borders has paler and white-edged leaves; flowers all summer in gardens, or in the greenhouse in winter. ①

A. saxátile, Linn. Rock A. Low, hoary-leaved, with abundant bright yellow flowers, in spring; a variety with white-edged leaves is also grown. ♃

9. LESQUERÉLLA. (For the late *Leo Lesquereux.*) ① ② or ♃ with stellate hairs or scales, and globular, inflated pods.

L. globòsa, Wats. ① or ② Stems spreading; petals bright yellow; style longer than the pod. Ky., Tenn., Mo. Two other species occur in our territory W. and S. W.

10. AUBRIÈTIA. (For *Aubriet,* a French botanical draughtsman.) ♃ Pods cylindric, inflated; seeds globular. Flowers purple.

A. deltoídea, DC. Leaves rhombic, with 1 or 2 large teeth. Racemes few-flowered. A pretty plant from S. Eu. for rockeries. Several garden varieties.

11. NASTÚRTIUM, WATER CRESS, HORSE-RADISH, etc. (Latin: *nasus tortus,* convulsed nose, from the pungent qualities.) Pods shortish or short (from oblong-linear to almost spherical). Here are combined a variety of plants, widely different in appearance. The following are the commonest:

* *Petals white, twice length of calyx; leaves pinnate.* ♃ *Nat. from Eu.*

N. officinàle, R. Br. Water Cress. Planted or run wild in streamlets, spreading and rooting, smooth; leaflets 3–11, roundish or oblong; flowers all summer; pods broadly linear, slightly curved upwards on their spreading pedicels. Young plants eaten.

* * *Petals yellow, little exceeding the calyx; leaves pinnatifid.* ① ②

N. sessiliflòrum, Nutt. Leaves obtusely incised; flowers minute, nearly sessile; pods oblong. Common from Illinois S.

N. obtùsum, Nutt. Leaves pinnately parted or divided; flowers minute; pods longer than the short pedicels. Ill., S. and westward.

N. palústre, DC. Marsh Cress. Erect, 1°–3° high, with pinnatifid or lyrate leaves of several oblong, cut-toothed leaflets; small yellowish flowers; and small oblong or ovoid pods, mostly shorter than the pedicels. A very common homely weed in wet places.

* * * *Petals white, much longer than the calyx; leaves undivided or the lower pinnatifid.* ♃

N. lacústre, Gray. Lake Cress. Aquatic; immersed leaves dissected, others entire, serrate, or pinnatifid. Lakes and rivers, N. Y. to Minn., and S. W. Detached leaves produce new plants, like leaf-cuttings.

N. Armoràcia, Fries. Horse-radish. Leaves very large, oblong, or lanceolate, chiefly from the ground, crenate, rarely cut, or pinnatifid; pods globular, but seldom seen. Planted or run wild in moist soil. The long deep root is a familiar condiment.

12. CAMÉLINA, FALSE FLAX. (Greek: *dwarf flax;* the common species was fancied to be a degenerate flax.) ①

C. satìva, Crantz. Common F. 1°–2° high; leaves lanceolate, the upper ones sagittate and clasping the stem; the small pale yellow flowers followed by obovate turgid pods in a long loose raceme; style conspicuous. A weed in grain and flax fields.

13. CHEIRÁNTHUS, WALLFLOWER. (Greek: *hand, flower.*) Slightly, if at all, hoary; the showy flowers orange, brown-reddish, or yellow; seeds flat. 2l

C. Cheìri, Linn. COMMON WALLFLOWER. Stem woody, crowded with the narrow and pointed, entire leaves. Cult. from S. Eu., not hardy N., a much-prized house-plant. Double varieties are especially ornamental.

14. BARBARÈA, WINTER CRESS. (Anciently called the Herb of Santa Barbara.) Seeds oval. Leaves used by some as winter salad, but bitterish. (Lessons, Figs. 425, 426.) ② 2l

B. vulgàris, R. Br. COMMON W. or YELLOW ROCKET. Smooth, with green, (sometimes variegated) lyrate leaves, and bright yellow flowers in spring and summer; pods erect, crowded in a dense raceme much thicker than their pedicels. Common in old gardens and other rich soil. Cult. as a salad; leaves closely resembling taste of Water Cress.

B. prœcox, R. Br. EARLY W. or SCURVY GRASS. Probably a variety of the last, with more numerous and narrower divisions to the leaves; the less erect pods scarcely thicker than their pedicels. Cult. from Penn., S., for early salad; beginning to run wild.

15. HÉSPERIS, ROCKET. (Greek: *evening,* the flowers being fragrant then.) Pods long and slender, with a single row of marginless seeds in each cell (as broad as the partition); flowers rather large. 2l

H. matronàlis, Linn. COMMON or DAME R. Tall and rather coarse; leaves oblong or lanceolate, toothed; flowers in summer, followed by (2′–4′) long and slender pods. Gardens, from Eu., inclined to run wild in rich shady soil.

16. MALCÒLMIA. (Named for *W. Malcolm*, an English gardener.) Pods somewhat thickened at the base. Otherwise much like Hesperis.

M. marítima, Br. MAHON STOCK, called VIRGINIA STOCK in England, but comes from the shores of the Mediterranean; a garden annual not much cult., a span high, with pale green, oblong, or spatulate nearly entire leaves, and pretty, pink-red flowers changing to violet-purple; also a white variety (much smaller than those of true Stock); pods long and slender.

17. THELYPÒDIUM. (Greek: *female, foot,* the ovary in some species stalked.) Flowers pink-purple, rather showy. ② 2l

T. pinnatífidum, Wats. (or ARABIS HESPERIDOÌDES). Smooth, erect, 1°–3° high; with rounded or heart-shaped long-petioled root-leaves, ovate-lanceolate stem-leaves (2′–6′ long), the lower on a winged petiole or with a pair of small lateral lobes; petals long-clawed; pods spreading, narrow; seeds wingless. Banks of the Ohio and W.

18. ERÝSIMUM. (Greek: *to draw blisters,* from the acridity.) Seeds oblong; sepals nearly equal and alike at the base.

* *Flowers orange.*

E. ásperum, DC. WESTERN WALLFLOWER. Wild from Ohio W. & S.; like the wild state of the Wallflower, with bright orange-yellow flowers, but the seeds are different, and the (3′–4′) long pods quite square in the cross-section; the leaves somewhat toothed and hoary. ② 2l

E. Perofskiànum, Fisch. & Mey. Stem simple; leaves lance-spatulate, remotely toothed; flowers showy; pods about 1′ long, obtusely 4-angled. Cult. from Caucasus.

* * *Flowers yellow.*

E. cheiranthoïdes, Linn. Treacle Mustard or Wormseed Mustard. Annual; branches slender; leaves lanceolate, almost entire; flowers small, yellow; stigma small. Along streams, N.

E. pulchéllum, Boiss. (or Cheiranthus pulchéllus). ♃ Compact growing, much branched at base; lower leaves oblong-spatulate, dentate, or lyrate, upper oblong or lanceolate, sharply pectinate-dentate; stigma broad as the pod; flowers showy, sulphur-yellow in spring. Cult. from Caucasus.

19. SISŸMBRIUM, HEDGE MUSTARD. (An ancient Greek name.) Pod either flattened or 4-sided, or the cross-section nearly circular; in the common species shortish, lance-awl-shaped, close-pressed to the stem; seeds oval, marginless. Flowers small. (Lessons, Figs. 427, 428.)

S. canéscens, Nutt. Hoary H. or Tansy Mustard. ① Hoary; leaves finely cut, twice-pinnatifid; flowers minute yellowish; pods oblong-club-shaped, 4-sided on slender horizontal pedicels. Pa. and N. Y. to Ill. and S. W. Common W.

S. officinàle, Scop. Common H. ① Stems branching; leaves runcinate; flowers very small, pale yellow, followed by awl-shaped, obscurely 6-sided pods close-pressed to the axis of the narrow spike. Coarse weed in waste places. Eu.

S. Thaliàna, Gaud. Mouse-ear Cress. ② Leaves obovate or oblong, entirely or barely toothed; flowers white; pods linear on spreading pedicels. Mass. to Kans. Eu.

20. BRÁSSICA, CABBAGE, MUSTARD, &c. (Ancient Latin name of Cabbage.) ① ② Pod oblong or linear, beaked or pointed beyond the summit of the valves, by the enlarged and persistent style base; seeds spherical. Cult. from Eu., or run wild as weeds. (Lessons, Fig. 235.)

* *Whole plant glaucous-blue when in flower; leaves of the flower-stems clasping; flowers various.*

+ *Leaves from the first more or less fleshy throughout, and glaucous-blue even when young; flowers creamy yellow.*

B. oleràcea, Linn. Cabbage Tribe. The original is a seacoast plant of Europe, with thick and hard stem, and pretty, large, pale yellow flowers; upper ones entire, clasping the stem, not auricled at the base; cult. as a biennial — the rounded, thick, and fleshy, strongly veined leaves collected into a head the first year upon the summit of a short and stout stem. Cauliflower and Broccoli have the nourishing matter mainly concentrated in short, imperfect, flower-branches collected into a flat head. Kohl-rabi has the nourishing matter accumulated in the stem, which forms a turnip-like enlargement above ground, at the origin of leaves. Kale is more nearly the natural state of the species, the fleshy leaves not forming a head. Brussels Sprouts has numerous small heads along the stem below the top leaves.

B. Nàpus, Linn. Rape. Leaves smooth from the first, more deeply scalloped than in the last, not forming thickened parts above ground.

B. campéstris, Linn. Ruta-baga or Swedish Turnip. First leaves hairy; the root usually tuberous.

+ + *Leaves (except upon the flower-stem) thin and green; flowers small and bright yellow.*

B. Pè-Tsài, Bailey. CHINESE CABBAGE, PE-TSAI. Leaves repand-sinuate or only rarely somewhat lyrate, smooth or very nearly so, the petiole thick and broadly winged; root annual, fibrous; leaves form a loose head, resembling Cos Lettuce. China.

B. Ràpa, Linn. TURNIP. Leaves prominently lyrate or interrupted below, hairy; the root tuberous.

* * *Plant green or but slightly glaucous when in flower; leaves of the flower-stem not prominently clasping; flowers small and yellow.*

B. nìgra, Koch. BLACK MUSTARD. Leaves somewhat hairy and divided; pods erect in the raceme or spike, smooth, short, 4-sided (the valves having a strong midrib), and tipped with the short, empty, conical base of a slender style; seeds dark brown, small, pungent. Cultivated and in waste places. Eu. ①

B. álba, Boiss. WHITE MUSTARD. Leaves all pinnatifid and rough-hairy; pods spreading in the raceme, bristly hairy, the lower part thick and few-seeded; seeds large, pale brown. Run wild, from Eu. ①

B. Sinapístrum, Boiss. CHARLOCK. Pods knotty, nearly smooth, fully one third comprised in a stout 2-edged beak which is either empty or 1-seeded; upper leaves barely toothed. Weed in grain fields. Eu. ①

21. CAPSÉLLA, SHEPHERD'S PURSE. (Name means *a little pod.*) (Lessons, Figs. 402, 403.) ①

C. Búrsa-Pastòris, Moench. COMMON S. The commonest of weeds, in waste places; root-leaves pinnatifid or toothed, those of the stem sagittate and partly clasping; small white flowers followed by the triangular and notched pods, in a long raceme.

22. LEPÍDIUM, PEPPERGRASS, CRESS. (Greek: *little scale*, from the pods.) Our common species have incised or pinnatifid leaves, and very small white or whitish flowers. ①

* *Plant green.*

+ *Leaves large, clasping; hairy.*

L. campéstre, Br., has run wild (from Eu.) eastward. Known by its strict habit, entire or only toothed leaves, and ovate winged rough pod.

+ + *Leaves small, tapering at base, the lower ones at length falling; smooth.*

L. Virgínicum, Linn. WILD P. Cotyledons accumbent; petals present, and usually only 2 stamens; the little pods scarcely margined at the notched tops; seeds flat. A common weed by roadsides.

L. intermèdium, Gray. Cotyledons incumbent as in the following; pod minutely wing-margined at top; petals minute or 0. W. N. Y. and N. Ill., N. and W. in dry places.

L. ruderàle, Linn., introduced from Europe, is much less common, more branched, with no petals, the smaller scarcely notched pods and turgid seeds marginless.

* * *Plant very glaucous.*

L. satìvum, Linn. GARDEN CRESS. Cultivated as a salad plant, has petals, and the larger ovate pods are winged and slightly notched at the top; leaves (except the very uppermost) compound or much divided. Eu.

23. SENEBIÈRA, WART CRESS, SWINE CRESS. (For *J. Senebier*, a distinguished physiologist.) Prostrate ① and ②, with minute whitish flowers. Weeds from Eu.

S. dídyma, Pers. Pods rough-wrinkled, notched at apex. Waste places. Mass. and S. near seacoast.

S. Coronòpus, DC. Pods warty, not notched at the apex. R. I. to Va. at seaports.

24. IBÈRIS, CANDYTUFT. (*Iberia*, an old name for Spain.) The 2 petals on the outer side of the flower much larger than the others. Pods scale-shaped, roundish or ovate, notched at the wing-margined top. Low garden plants, from Europe, much cultivated for ornament.

* *Perennial, woody at the base.*

I. sempérvirens, Linn. EVERGREEN C. Rather woody-stemmed, tufted, with bright green, lanceolate or linear-spatulate, thickish, entire leaves, and flat clusters of pure white flowers, in spring.

I. Gibraltárica, Linn., with large, rose-purple flowers in early spring, and wedge-shaped leaves, is occasionally seen; not hardy N.

* * *Annual.*

I. umbellàta, Linn. COMMON C. Lower leaves lanceolate, the upper linear and entire; flowers purple-lilac (or pale), in flat clusters in summer. Eu.

I. coronària, Don. ROCKET C. Leaves lanceolate, coriaceous, sparingly toothed. Flowers pure white in dense, spike-like racemes in summer. Nativity uncertain.

25. ISÀTIS, WOAD. (Name of obscure derivation.) ② One common species of Eu.

I. tinctòria, Linn. DYER'S WOAD. Rather tall, glabrous and glaucous, the stem-leaves lanceolate and entire, sessile and somewhat sagittate; racemes of small yellow flowers panicled, succeeded by the hanging samara-like closed pods; flowers in early summer. Old gardens; formerly cult. for a blue dye.

26. CAKÌLE, SEA ROCKET. (An old Arabic name.) ①

C. Americàna, Nutt. AMERICAN S. A fleshy herb, wild on the shore of the sea and Great Lakes, with obovate wavy-toothed leaves, and purplish flowers.

27. RÁPHANUS, RADISH. (Greek: *to appear quickly*, referring to the very rapid germination of the seeds.) ① ② From the Old World.

R. Raphanístrum, Linn. WILD R. or JOINTED CHARLOCK. Leaves rough lyrate; petals yellow, changing to whitish or purplish, and pods narrow, long-beaked, divided across between the several seeds, so as to become necklace-form. Troublesome weed in cult. fields.

R. satìvus, Linn. RADISH. Lower leaves lyrate; flowers purple and whitish, and closed pods thick and pointed; the seeds separated by irregular fleshy false partitions; cult. for the tender and fleshy pungent root; inclined to run wild.

R. caudàtus, Linn. RAT-TAIL RADISH. Probably a form of the last, with small woody root and pods (used for pickles) 6′–12′ long.

XI. CAPPARIDACEÆ, CAPER FAMILY.

Herbs (in our region) resembling *Cruciferæ*, but with stamens not tetradynamous and often more than 6, no partition in the pod (which is therefore 1-celled with two parietal placentæ), and kidney-shaped seeds, the embryo rolled up instead of folded together; the leaves commonly palmately compound, and the herbage bitter and nauseous instead of pungent. But in warm regions the cress-like pungency sometimes appears, as in *capers*, the pickled flower-buds of CÁPPARIS SPINÒSA of the Levant. This and its near relatives are trees or shrubs.

1. CLEOME. Calyx 4-cleft. Petals 4. Stamens 6, on a short, thickened receptacle. Ovary and many-seeded pod in ours raised above the receptacle on a long stalk. Style very short or none. Usually an appendage on 1 side of the receptacle.
2. POLANISIA. Sepals 4. Stamens 8–32. Ovary and pod sessile or short-stalked on the receptacle. Style present. Otherwise nearly as in No. 1.
3. GYNANDROPSIS. Sepals 4. Stamens borne on the long stalk of the ovary far above the petals. Otherwise as in No. 1.

1. CLEÒME. (Name of uncertain derivation.) ①

C. púngens, Willd. Tall (2°–4° high), clammy-pubescent, with little spines or prickly points (whence the name) in place of stipules, about 7 broadly lanceolate leaflets, but the bracts simple and ovate or heart-shaped, and a raceme of large and handsome flowers, with long-clawed, pink or purple petals and declined stamens. Cult. from S. A., and run wild S.

C. integrifòlia, Torr. & Gray, much smaller, smooth, with 3 leaflets and the pink petals without claws, is wild in Minn. to Kans., and cult. in gardens, also for bees under the name ROCKY MOUNTAIN BEE PLANT.

2. POLANÍSIA. (Greek: *many unequal*, referring to the stamens.)

P. gravèolens, Raf. A heavy-scented (as the name denotes), rather clammy, low herb, with 3 oblong leaflets, and small flowers with short white petals, about 11 scarcely longer purplish stamens, and a short style; flowers summer. Wild on gravelly shores from Vt. to Md. and W.

3. GYNANDRÓPSIS. (Greek: meaning that the stamens appear to be on the pistil.) (Lessons, Fig. 357.)

G. pentaphýlla, DC. Clammy-pubescent weed, with 5 leaflets to the leaves and 3 to the bracts; the white petals on claws. West Indies; naturalized from Carolina, S.

XII. RESEDACEÆ, MIGNONETTE FAMILY.

Herbs, with inconspicuous flowers in spikes or racemes.

1. RESÈDA, MIGNONETTE, etc. (Latin: *to calm*, from supposed sedative properties.) Calyx 4–7-parted, never closed even in the bud; petals 4–7, unequal, cleft or notched, those of one side of the flower appendaged within; stamens 10–40, borne on a sort of disk dilated on one side of the flower; ovary and pod composed of 3–6 carpels, united not quite to the top into a 3–6-lobed or 3–6-horned, 1-celled pistil which

opens at the top long before the seeds are ripe; the seeds are numerous, kidney-shaped, on 3–6 parietal placentæ; leaves alternate.

* *Leaves not compound; flowers yellowish.*

R. odoràta, Linn. Common Mignonette. ① Anthers orange; petals 6, the posterior ones cut into several fine lobes; stems low; some leaves entire and oblong, others 3-lobed. N. Africa. Cult. for the delicious scent of the yellowish-white flowers.

R. Lutèola, Linn. Dyer's Weed or Weld. Tall, with lanceolate, entire leaves, and a long spike of yellowish flowers; petals 4. Nat. along roadsides. Eu.

* * *Leaves compound, or essentially so; flowers white.*

R. álba, Linn. White or Upright M. ① or ②, 2°–3° high, with long, dense spikes of white flowers with brown anthers, and leaves all pinnate or pinnatifid, the divisions lanceolate. Cult. from S. Eu.

XIII. PITTOSPORACEÆ, PITTOSPORUM FAMILY.

A small family of shrubs and trees, belonging mostly to the southern hemisphere, a few in common cultivation:

1. **PITTÓSPORUM.** (Greek: *pitch, seed;* the seeds are generally covered with a sticky exudation.) Flowers regular, of 5 sepals, 5 petals, and 5 stamens; the claws of the petals sometimes slightly united; ovary 1-celled with 3 parietal placentæ; a single style and stigma; fruit a globular woody pod, many-seeded. Greenhouses.

P. Tobìra, Ait. Common P. Leaves obovate and retuse, evergreen, crowded at the end of the branches, which are terminated by a small, sessile umbel of white, fragrant flowers, produced in winter. Japan. A low tree cultivated as a house-plant N., hardy S.

P. undulàtum, Andr., from Australia, has oval-lanceolate undulated leaves tapering at both ends, and white flowers in close panicles.

P. viridiflòrum, Sims (or P. Sinénse), from the Cape of Good Hope, has obovate and retuse leaves and greenish-yellow jasmine-scented flowers in somewhat globose panicles.

XIV. CISTACEÆ, ROCKROSE FAMILY.

Shrubby or low herbaceous plants, with regular flowers; a persistent calyx of 5 sepals, two of them exterior and resembling bracts; the petals and stamens on the receptacle; the style single or none; ovary 1-celled with 3 or 5 parietal placentæ (Lessons, Fig. 334), bearing orthotropous ovules.

1. HELIANTHEMUM. Petals 5, crumpled in the bud, fugacious (falling at the close of the first day), or none. Stamens and ovules many in the complete flower; placentæ 3. Style none or short. Low, yellow-flowered; in sandy or gravelly soil.
2. HUDSONIA. Petals 5, fugacious, much larger than the calyx. Stamens 9–30. Style slender. Ovules 2–6. Heath-like shrubs, 6′–12′ high; leaves minute, downy, closely covering the branches; flowers small, yellow, opening in sunshine in spring and summer. Near the coast and Great Lakes.

3. LECHEA. Petals 3, persistent, not longer than the calyx. Stamens 3–12. Style none Pod partly 3-celled, 6-seeded. Small homely herbs, with inconspicuous, greenish, or purplish flowers, and pods about the size of a pin's head, whence the popular name. Flowers summer and autumn in sterile soil.

1. HELIÁNTHEMUM, ROCKROSE. (Greek: *sun, flower;* the blossoms opening only in sunshine.) (Lessons, Figs. 334, 430.) 2

H. Canadénse, Michx. Frostweed. Lance-oblong leaves, hoary beneath; flowers produced all summer, some with showy corolla 1′ broad and many stamens; others small and clustered along the stem, with inconspicuous corolla and 3–10 stamens; the latter produce small, few-seeded pods. The only one common N. Popular name from the formation of crystals of ice in late autumn about the cracked bark of the root.

H. corymbòsum, Michx. Downy all over, with smaller flowers clustered at the top of the stem, and larger ones long-peduncled. Along the coast from N. J., S.

H. vulgàre, Gærtn. The Rockrose, of the Old World; with yellow, whitish, or red flowers in racemes and procumbent stems; occasionally grown in gardens.

H. Caroliniànum, Michx. Hairy, with green leaves, the lower obvate and clustered; flowers all large-petaled and scattered, in spring. S. States.

2. HUDSÒNIA. (For an English botanist, *William Hudson.*) 2

H. ericoìdes, Linn. Greenish; leaves awl-shaped; flowers peduncled. From Va., N.

H. tomentòsa, Nutt. Hoary with soft down; leaves oblong or oval and close-pressed; peduncles short or hardly any. From Md. to Me. and about the Great Lakes.

3. LÉCHEA, PINWEED. (For *Leche*, a Swedish botanist.) 2

* *Hairs long and soft, spreading; leaves oblong; flowers in small cymose clusters.*

L. màjor, Michx. Larger P. Stem upright, hairy, 1°–2° high; leaves elliptical, mucronate; flowers densely clustered. Borders of sterile woodlands.

* * *Hairs appressed; leaves mostly narrower; flowers paniculate.*

+ *Leaves thin, cauline ones, oval or oblong; panicles leafy.*

L. thymifòlia, Michx. Erect, about 2° high; pod obovate-globose. Atlantic coast.

+ + *Leaves firm, cauline ones linear to slender awl-shaped; panicles rather naked and raceme-like.*

++ *Pod nearly globose.*

L. mìnor, Linn. Smaller P. Stems low, 12′–18′ high, rather strict; flowers loosely clustered. Open sterile ground.

Var. **marítima**, Gray, is stouter and stiffer, with linear, hoary, radical leaves. In sandy soil, Mass. S., near the coast.

L. tenuifòlia, Michx. Low, slender and diffuse; leaves very narrow and small. E. Mass. to Mo. and S.

++ ++ *Pod ellipsoidal.*

L. racemulòsa, Lam. Erect, leaves oblong-linear; inflorescence loose. Dry places, Long Island to Ky. and S.

XV. VIOLACEÆ, VIOLET FAMILY.

Herbs. Sepals 5, persistent. Petals 5, more or less unequal, the lower one with a sac or spur at the base. (Lessons, Figs. 237, 238, 276, 347, 420, 429.) Stamens 5, short; the very broad flat filaments conniving or cohering around the pistil. Style usually club-shaped; stigma 1-sided. Ovary and pod 1-celled, with 3 parietal placentæ, containing several rather large seeds. Herbs, with stipules to the alternate leaves, and 1-flowered peduncles.

1. VIOLA. Sepals eared at base; stamens distinct, the two lower bearing spurs which extend into the spur of the corolla. Cleistogamous blossoms are common and highly fruitful, especially among stemless species. (See Lessons, p. 115.)
2. SOLEA. Sepals not eared at base; stamens united into a sheath having a broad gland below instead of spurs.

1. VÌOLA, VIOLET, HEART'S-EASE. (The ancient Latin name.)

* Stemless Violets, *with leaves and peduncles all from creeping or subterranean rootstocks, there being no proper ascending stems; all flowering in spring.*

+– *Garden species, from Europe; fragrant.*

V. odoràta, Linn. Sweet Violet. Tufts spreading by creeping runners; leaves rounded heart-shaped, more or less downy; flowers violet-blue, varying to white; single, or in cultivation commonly full double. Hardy.

+– +– *Wild species; only slightly sweet-scented or scentless.*

++ *Flowers blue or violet-color.*

= *Rootstock short and thick; stigma not beaked; lateral petals not bearded.*

V. pedàta, Linn. Bird-foot V. Leaves all cut into linear divisions or lobes; the flower large, beardless, usually light violet-color, sometimes whitish, sometimes the two upper petals deep dark violet, like a pansy; sandy or light soil.

= = *Rootstock fleshy and thickened; stigma beaked; spur short and sac-like; lateral petals bearded.*

V. pedatífida, G. Don. (or V. dephinifòlia). Leaves all palmately divided or parted; segments 2–3-cleft; lobes linear. Prairies, Ill. W.

V. palmàta, Linn. Common Blue V. Rootstocks matted, scaly-toothed; leaves erect and heart-shaped or kidney-shaped, obscurely serrate, the later ones, 3–7-cleft or parted, with the sides at the base rolled in when young, on long petioles; flowers sometimes pale or variegated with white.

The var. **cucullàta**, Gray, has the later leaves merely crenate, not lobed. Both forms very variable and common.

V. sagittàta, Ait. Arrow-leaved V. Leaves varying from oblong-heart-shaped to ovate and often rather halberd-shaped, toothed near base, the earlier ones on short and margined petioles; flower large in proportion; common.

= = = *Rootstock long and slender, extensively creeping; spur almost as long as the beardless petals.*

V. Selkírkii, Pursh. Selkirk's V. Small, only 2′ high, the rounded, heart-shaped leaves spreading flat on the ground; the flower large in proportion; on shady banks, only N.

+ + *Flowers (small) white, the lower petal purplish-veined.*

V. blánda, Willd. Sweet White V. Very common, with faintly sweet-scented flowers; petals mostly beardless; leaves rounded heart-shaped or kidney-shaped.

V. primulæfòlia, Linn. Primrose-leaved V. Between the last and next, has oblong or ovate leaves, abrupt or cordate at base; petals sparingly bearded. Toward the coast.

V. lanceolàta, Linn. Lance-leaved V. Leaves lanceolate, tapering into long petioles; petals beardless. Commonest E. and S.

+ + + *Flowers yellow; lateral petals with brown veins.*

V. rotundifòlia, Michx. Round-leaved V. Leaves roundish, heart-shaped, flat on the ground, becoming large and shining in summer; spreads by runners; flowers small. In cold woods N., and S. in Alleghanies.

* * Leafy-stemmed Violets, *wild, perennial; flowering in spring and summer; stipules not leaf-like.*

+ *Stipules entire; spur very short.*

+ + *Stems 2–4-leaved above, naked below; flowers yellow, short-spurred.*

V. pubéscens, Ait. Downy Yellow V. Soft-downy, also a rather smooth variety; leaves broadly heart-shaped; stipules large. Woods, common.

V. hastàta, Michx. Halberd-leaved V. Smoother; leaves halberd-shaped or oblong-heart-shaped; stipules small. Scarce W. and S.

+ + *Stems more leafy; flowers white and violet.*

V. Canadénsis, Linn. Canada V. Common in rich woods N. and W.; 1°–2° high, large-leaved; flowers all summer; the petals white or purplish above, the upper ones violet-purple underneath; spur very short and blunt.

+ + *Stipules fringe-toothed; spur oblong to cylindrical; flowers white or violet.*

V. striàta, Ait. Pale V. Low; flowers creamy-white, with lower petal purple-lined; spur short; stipules large in proportion. Not rare N. and W.

V. rostràta, Pursh. Long-spurred V. 6′ high, and slender spur longer than the pale violet, beardless petals. Fields N. and W.

V. canìna, Linn. Dog V., the Amer. variety (var. *Muhlenbergii*, Gray). Low, with creeping branches or short runners; spur cylindric, half the length of the violet flower; lateral petals slightly bearded; common in low grounds.

* * * Pansy Violets, *from Europe, with leafy and branching stems and large, leaf-like stipules; flowering through the spring and summer.*

V. tricolor, Linn. Pansy or Heart's-ease. Cult. or running wild in gardens, low, with roundish leaves or the upper oval and lowest heart-shaped; stipules lyrate-pinnatifid; petals of various colors, and often variegated, and under cultivation often very large and showy, the spur short and blunt. Var. ***arvénsis***, is a field variety, slender and small-flowered, thoroughly naturalized in some places. ① ② ♃

V. cornùta, Linn. Horned V. Sometimes cult. in borders; has stipules merely toothed, and light violet-purple flowers with a very long and slender spur. ♃ Pyrenees.

2. SÒLEA, GREEN VIOLET. (For *William Sole*, author of an essay on British Mints.) 2

S. cóncolor, Ging. 1°–2° high; stems leafy, with 1–3 small, greenish, axillary flowers; leaves oblong, entire. N. Y. to Kan. and S.

XVI. CARYOPHYLLACEÆ, PINK FAMILY.

Bland herbs, with opposite, entire leaves, regular flowers with not over 10 stamens, a commonly 1-celled ovary with the ovules rising from the bottom of the cell or on a central column, and with 2–5 styles or sessile stigmas, mostly separate to the base. (Lessons, p. 108, Figs. 331, 332.) Seeds with a slender embryo on the outside of a mealy albumen, and usually curved into a ring around it. Calyx persistent. Petals sometimes minute or wanting. Two great divisions or tribes, viz. the true PINK FAMILY and the CHICKWEED FAMILY.

I. PINK SUBFAMILY. Sepals (5) united below into a tube or cup. Petals with slender claws, which are inclosed in the calyx tube, and commonly raised within it (with the 10 stamens), on a sort of stalk, often with a cleft scale or crown at the junction of the blade and claw. (Lessons, p. 90, Fig. 248.) Pod mostly opening at the top, many-seeded.

* *Calyx with a scaly cup or set of bracts at its base; seeds attached by their face; embryo nearly straight.*

1. DIANTHUS. Calyx cylindrical, faintly many-striate. Petals without a crown. Styles 2.

* * *Calyx naked at base; seeds attached by the edge; embryo curved.*

\+ *Styles* 2.

2. SAPONARIA. Calyx cylindrical, pyramidal, or oblong, often angled, 5-toothed. Pod 4-valved at the top.
3. GYPSOPHILA. Calyx bell-shaped, 5-cleft, or thin and delicate below the sinuses. Pod 4-valved. Flowers small and panicled, resembling those of Sandwort, etc.

\+ \+ *Styles* 3 *or more.*

4. LYCHNIS. Styles 5, rarely 4. Calyx opening by 5 or more teeth.
5. SILENE. Styles 3. Calyx opening by 3–6 teeth.

II. CHICKWEED SUBFAMILY. Petals spreading, without claws, occasionally wanting. Sepals (4 or 5) separate, or united only at base, or rarely higher up. Flowers small, compared with the Pink Family, and the plants usually low and spreading or tufted.

* *Without stipules; generally with petals; pod several-seeded.*

\+ *Styles opposite the sepals, or when fewer, opposite those which are exterior in the bud.*

6. ARENARIA. Petals entire, rarely none. Styles commonly 3. Pod globular or oblong, splitting into as many or twice as many valves as there are styles.

7. STELLARIA. Petals white, 2-cleft, or sometimes none. Styles usually 3, sometimes 4. Pod globular or ovoid, splitting into twice as many valves as there are styles.

8. CERASTIUM. Petals longer than the calyx, notched at the end or 2-cleft, rarely none. Styles 5. Pods cylindrical, opening at the top by 10 teeth.

+ + Styles 4 or 5, alternate with the 4 or 5 sepals.

9. SAGINA. Petals entire or none. Pod splitting into 4 or 5 valves. Small plants, 1'–6' high, tufted.

** * With scarious stipules between the leaves, rather conspicuous and entire petals, and a many-seeded 3–5-valved pod.*

10. BUDA. Leaves opposite. Styles usually 3. Flowers reddish, produced all summer.

11. SPERGULA. Leaves in whorls. Styles 5, as many as the sepals and alternate with them. Flowers otherwise as in Buda.

1. DIÁNTHUS, PINK. (Greek: *Jove's flower.*) All but the first species cultivated for ornament; flowers summer.

** Flowers sessile and many in a close cluster; bracts lance-awl-shaped.*

D. Armèria, Linn. DEPTFORD PINK. ① A rather insignificant plant; leaves hairy, linear; flowers very small, scentless; petals rose-color with whitish dots. Eu. Nat. eastward.

D. barbàtus, Linn. SWEET WILLIAM OR BUNCH PINK. Leaves oblong-lanceolate, green; various colored flowers in a very flat-topped cluster; the petals sharply toothed. Abounds in all country gardens; many double-flowered choice varieties. 2 Eu.

** * Flowers single at the ends of the branches; leaves narrow and often grass-like, rather rigid, glabrous and glaucous, usually without any evident veins.*

+ Bracts linear, acute, as long as the calyx. ① ②

D. Chinénsis, Linn. (or D. HEDDEWIGII). CHINA OR INDIAN PINK. Leaves lanceolate, short, and broad, less rigid than any of the following; the large petals toothed or cut, of various colors, red predominating. Numerous garden varieties, — dwarf, double and single-flowered, some with deeply cut petals.

+ + Bracts short and mostly broad. 2

++ Petals deeply fringed.

D. plumàrius, Linn. COMMON PINK of old gardens. A low, hardy species, making broad tufts, with small, very glaucous leaves, sending up flower-stems in early summer, the white, or pink, or variegated petals cut into a fringe of slender lobes. Eu.

D. supérbus, Linn. Taller, less tufted, and later-flowered; the large petals entirely dissected into delicate, almost capillary divisions. Eu.

++ ++ Petals dentate or entire.

D. Caryophýllus, Linn. CARNATION, CLOVE PINK, PICOTEE, GRENADINE, etc. Stems hard or almost woody below; long-linear, very glaucous leaves; the bracts very short and broad. Various colors, as white, pink, red, yellow, and variegated. In this country grown mostly indoors, but there are many hardy border varieties. Eu.

D. deltoides, Linn. A low plant (1° or so high) growing in mats; leaves short, narrowly lanceolate, roughish; bracts sharp and half as long as calyx-tube; petals rose-color or white. Cult. from Eu. and occasionally naturalized.

2. SAPONÀRIA, SOAPWORT. (Latin and common names from the mucilaginous juice of the stem and root forming a lather.) From Eu. (Lessons, Fig. 248.)

* *Petals notched; plants smooth.*

S. officinàlis, Linn. Common S. or Bouncing Bet. 1°–2° high; leaves ovate or oval; flowers rather large, rose-color or white, single or double, in dense clusters; the petals crowned; calyx not angled. Cult. and along roadsides. ♃

S. Vaccària, Linn. Cow Herb. Leaves lanceolate and pale, partly clasping; flowers pale red in loose open cyme; calyx becoming strongly winged. Cult. and runs wild. ①

* * *Petals entire; plant hairy.*

S. ocymoìdes, Linn. Basil S. Profusely branched; leaves ovate-lanceolate acute; calyx purplish, cylindric; petal-limb not narrowed. Cult. ♃

3. GYPSÓPHILA. (Greek: *loving gypsum,* because preferring calcareous soil.)

G. paniculàta, Linn. Baby's Breath. Very smooth, pale, 1°–2° high; with lance-linear leaves and branches repeatedly forking into very loose and light cymes, bearing innumerable very small and delicate white flowers. Cult. ♃ Eu.

G. élegans, Bieb. Elegant G. 1°–2° high, loosely spreading; with lanceolate leaves much larger (½′ broad) and fewer flowers, white or slightly rosy. Cult. ① Caucasus.

G. muràlis, Linn. Low, leaves very narrowly linear; flowers purplish on slender pedicels solitary in the forks. Sparingly naturalized from Eu. and cult. ①

4. LÝCHNIS. (Greek: *lamp,* an old name applied to some flame-colored species.) All from the Old World; flowers summer.

§ 1. *Calyx with long, leaf-like lobes; petals not crowned.* ①

L. Githàgo, Lam. Corn Cockle. Hairy, with long, linear leaves, and long-peduncled, showy, red-purple flowers; in fruit the calyx-lobes falling off. A weed in grainfields, the black seeds injurious to the grain.

§ 2. *Calyx without long, leaf-like lobes; petals crowned with a 2-cleft little scale or pair of teeth on the base of the blade or at the top of the claw.* ♃ ②

* *Flowers in dense cymes, 1′ or less broad.*

L. Chalcedónica, Linn. Scarlet L. Very common in country gardens; tall, rather hairy, and coarse, with lance-ovate, partly clasping green leaves, and a very dense, flat-topped cluster of many smallish flowers; the bright scarlet or brick-red petals deeply 2-lobed.

L. Viscària, Linn. Occasional in gardens; smooth, but the slender stem glutinous towards the top; leaves linear; flowers many, in a narrow, raceme-like cluster, rather small; calyx tubular or club-shaped; petals pink-red, slightly notched; also a double-flowered variety.

L. alpìna, Linn. Dwarf, 6′ high, tufted; quite smooth; leaves crowded; flowers in a round-topped cluster, petals deeply notched. Perhaps a var. of the preceding. Eu.

* * *Flowers few or single, very large (2′ or more).*

L. grandiflòra, Jacq. Smooth; leaves oblong, tapering to both ends; flowers short peduncled; the red or scarlet petals fringe-toothed at the end. Cult. from China.

L. fúlgens, Fischer. Hairy, 1°–2° high; leaves ovate-lanceolate; flowers bright vermilion; petals deeply cleft, with 2 linear, awl-shaped, lateral lobes. Siberia.

* * * *Flowers smaller, scattered or in loose clusters.*

+ *Petal limb slightly notched.*

L. coronària, Lam. Mullein Lychnis, Dusty Miller or Mullein Pink. Cult. in gardens; the flower crimson and like that of Corn Cockle; teeth of the calyx short and slender; plant white-cottony; leaves oval or oblong. ② 2ℓ

+ + *Petal limb cleft into 4-linear lobes.*

L. Flos-cùculi, Linn. Cuckoo L. Ragged Robin is the double-flowered variety, in gardens. Slightly downy and glutinous, with lanceolate leaves, and an open panicle of pink-red flowers.

+ + + *Petal limb 2-cleft.*

L. diúrna, Sibth. Day-blooming L. Double-flowered form also called Ragged Robin in the gardens; smoothish or soft-hairy, slightly sticky; leaves oblong or lance-ovate, the upper ones pointed; flowers scattered or somewhat clustered on the branches, rose-red or white, opening in morning.

L. vespertìna, Sibth. Evening-blooming L. Sticky pubescent; calyx ovate, enlarging; the flowers commonly diœcious, white, and open after sunset; the root biennial. But a full, double, day-flowering perennial variety in gardens, is a white sort of Ragged Robin. A weed in some waste grounds. ②

5. **SILÈNE**, CATCHFLY. (Greek, *saliva;* both names refer to the sticky exudation on stems and calyx of several species, by which small insects are often caught.) Flowers mostly all summer. (Lessons, Figs. 259, 356.)

* *Calyx inflated or bladdery; petals rather small, white, crownless or nearly so; not sticky.* 2ℓ

S. stellàta, Ait. Starry Campion. Smooth; stem slender, 2°–3° high; leaves in whorls of 4, lance-ovate, pointed; flowers in a long and loose panicle; petals cut into a fringe. Wild on wooded banks.

S. Cucùbalus, Wibel. (or S. inflàta). Bladder Campion. Glaucous or pale and very smooth, 1° high; leaves ovate-lanceolate or oblong, opposite; flowers loosely cymose; the bladdery calyx veiny; petals 2-cleft. Nat. from Eu., N. Eng. to Ill.

* * *Calyx inflated; sticky pubescent; petals red or white, crowned.* ①

S. péndula, Linn. Whole plant reddish. Leaves oval-lanceolate, opposite; calyx obovate, purplish, the nerves darker; petals deeply notched. Cult. from S. Eu.

* * * *Calyx not inflated, oblong, tubular, or club-shaped; somewhat sticky pubescent; wild species with crowned pink or red petals.* 2ℓ

S. Pennsylvánica, Michx. Pennsylvanian C. or Wild Pink. Stems 4′–8′ high, bearing 2 or 3 pairs of lanceolate leaves and a cluster of short-stalked middle-sized flowers in spring; petals pink-red, wedge-shaped, slightly notched. Gravelly soil. N. Eng. to Ky. and S.

S. Virgínica, Linn. Virginian C. or Fire Pink. 1°–2° high; leaves spatulate or lanceolate; flowers few, peduncled; the pretty, large, bright, crimson-red petals 2-cleft. Open woods W. and S.

S. règia, Sims. Royal C. Like the last, but 3° high, with lance-ovate leaves, numerous short-peduncled flowers in a narrow panicle, and narrower, scarlet-red petals, scarcely cleft. Prairies, etc., Ohio to Mo. and S.

* * * * *Calyx not inflated; petals crowned. Weeds or cult.* ① ②

← *Smooth, a part of each of the upper joint of stems glutinous; flowers small.*

S. Armèria, Linn. SWEET WILLIAM C. Stem about 1° high; flowers showy in flat-topped cymes; calyx slender, club-shaped; petals notched, bright pink, or a white variety, opening only in sunshine; leaves lance-ovate, glaucous. Eu. Cult. and escaped.

S. compácta, Fischer. 12′–18′ high; flowers in dense cymes (almost fascicled); petals with an obovate, entire, or erose limb. ② Cult. from Caucasus.

S. antirrhìna, Linn. SLEEPY C. Stem slender, 8′–30′ high, rather simple; flowers very small, panicled; calyx ovoid; petals rose-color, obcordate, opening only at midday in sunshine; leaves lanceolate or linear. Dry soil; common.

← ← *All over sticky-hairy; naturalized from Eu.*

S. noctiflòra, Linn. NIGHT-FLOWERING C. Tall coarse weed in cult. or waste grounds; lower leaves spatulate, upper lanceolate and pointed; flowers single or in loose clusters terminating the branches, with awl-shaped calyx-teeth and white or pale rosy 2-parted petals, opening at night-fall or in cloudy weather.

6. ARENÀRIA, SANDWORT. (Latin: *sand*, in which several species grow.) Plants of various habit, usually low and tufted. All the following are wild, also some others less common. Flowers spring and summer. (Lessons, Figs. 215, 331, 332.)

* *Petals inconspicuous, white.*

A. serpyllifòlia, Linn. 2′–6′ high; stems erect, roughish, much branched; leaves ovate, pointed; flowers in leafy cymes; petals scarcely longer than the 3–5-nerved pointed sepals. ① Sandy or gravelly waste places. Eu.

A. diffùsa, Ell. SPREADING S. Plant soft-downy; stems diffusely branched, prostrate, 1° or more long; leaves lanceolate; peduncles lateral, 1-flowered; petals shorter than the sepals or none. 2ℓ Shady grounds S.

* * *Petals conspicuous, longer than the calyx, white.* 2ℓ

← *Leaves small, rigid, awl-shaped or bristle-shaped; 3′–6′ high.*

A. Carolinìana, Walt. (or A. SQUARRÒSA). PINE-BARREN S. Densely tufted from a deep root; leaves imbricated but spreading, obscuring the internodes; sepals obtuse. In sand, coast of N. J. and S.

A. Michaùxii, Hook.f. Usually diffuse from a small root; internodes evident; leaves with many others, clustered in the axils; sepals acute. Rocks and wooded banks N. and W.

← ← *Leaves soft and herbaceous, filiform-linear; petals retuse or notched.*

A. pátula, Michx. Minutely pubescent, diffusely branched filiform stems, 6′–10′ long; sepals lanceolate, acuminate, 3–5-nerved. Va., W. to Kansas.

← ← ← *Leaves oval, oblong, or ovate.*

A. lateriflòra, Linn. SIDE-FLOWERING S. Plant minutely downy; stem erect, 3′–10′ high, sparingly branching; peduncles few-flowered, soon becoming lateral by the farther growth of the leafy stem; leaves oval or oblong. Gravelly shores and banks, N. and W.

A. peploìdes, Linn. SEA S. 6′–10′ high; leaves very fleshy, ovate; flowers axillary. Sands of seashore N.

7. STELLÀRIA, CHICKWEED STARWORT. (Latin: *stella*, a star.) Flowers spring and summer. (Lessons, Figs. 345, 431, 432.)

* *Stems weak and spreading, marked with pubescent lines; leaves broad.*

S. mèdia, Smith. COMMON CHICKWEED. Leaves ovate or oblong, the lower on hairy petioles; petals shorter than the calyx, 2-parted; stamens 3–10. ① In all damp cult. grounds.

S. pùbera, Michx. GREAT C. Leaves oblong or oval, sessile; petals longer than the calyx, 2-cleft. ♃ Shaded rocks, Penn., S., and W.

* * *Wholly glabrous; stems erect or spreading; leaves narrow, sessile.* ♃

+ *Petals 2-parted, equaling or surpassing calyx; bracts scale-like.*

S. longifòlia, Muhl. LONG-LEAVED S. or STITCHWORT. Stem weak with rough angles, 8′–18′ high; leaves linear, widely spreading, acutish at both ends; flowers numerous on slender, spreading pedicels, in a very loose cyme; petals 2-parted, longer than the calyx; seeds smooth. Common in damp grassy places N.

S. lóngipes, Goldie. Very smooth; leaves ascending, lanceolate, or linear-lanceolate, broadest at base; flowers on long, strictly erect pedicels; seeds smooth. Rare in N. U. S.; commoner in Canada.

S. gramínea, Linn. Like the last; leaves broadest above the base; pedicels widely spreading; seeds wrinkled. Nat. from Eu. A yellow-leaved variety is sometimes used in carpet bedding.

+ + *Petals shorter than calyx or 0; bracts leaf-like.*

S. boreàlis, Bigel. NORTHERN S. Stem 3′–10′ high, forking repeatedly and with flowers in the forks of the leafy branches; leaves broadly lanceolate or narrow-oblong. Wet grassy places N.

8. CERÁSTIUM, MOUSE-EAR CHICKWEED. (Greek: *horn;* referring to the pod of some species. Popular name from the shape and soft hairiness of the leaves of the common species.)

* *Flowers inconspicuous, the deeply 2-cleft petals being shorter or little longer than the calyx; flowering all summer, white.*

C. viscòsum, Linn. An insignificant soft-hairy weed; stems erect, 4′–9′ high, slightly clammy; leaves ovate or obovate, small; pedicels in fruit and petals shorter than the acute sepals. ① E. and S.; not common.

C. vulgâtum, Linn. LARGER M. Stems spreading, 6′–15′ long, clammy-hairy; leaves oblong; pedicels becoming longer than the calyx; petals as long as the obtuse sepals. ② ♃ Common in grassy places.

C. nùtans, Raf. Clammy-pubescent, erect, 6′–18′ high, becoming very loosely many-flowered and branched; leaves oblong-lanceolate; petals longer than calyx; pods thrice the length of the calyx, nodding on the slender flower-stalk and curved upwards. In moist grounds. ①

* * *Flowers conspicuous, the snowy white petals 2 or 3 times the length of the calyx; plants forming matted tufts.* ♃

C. arvénse, Linn. FIELD M. Downy but green; leaves linear to narrowly lanceolate; flowering stems 4′–6′ high, few-flowered; petals notched at the end; pod scarcely longer than calyx. Dry fields, etc.

The var. **oblongifòlium** is larger, with oblong leaves and pod twice as long as calyx. — Var. **villòsum** is densely villous. European forms are sometimes grown for ornament.

C. tomentòsum, Linn. COTTONY M. Shoots spreading, crowded with oblong or linear white-woolly leaves making dense silvery mats; flower-buds and pedicels densely woolly; petals deeply 2-cleft. Cult. from Eu.

9. SAGÌNA, PEARLWORT. (Latin: *sagina*, fattening; of no application to these plants.) Small and insignificant plants, only two common.

S. procúmbens, Linn. Smooth; parts of the flower in fours as a rule; the petals (sometimes 0) shorter than the ovate obtuse sepals. Moist places. N. ① or ♃

S. decúmbens, Torr. & Gray. Pedicels, calyx, and margins of upper leaves at first glandular pubescent; parts of the flower in fives; pod nearly twice length of acutish sepals. Mass. to Mo., and common S. ①

10. BÙDA, SAND SPURREY. (After the city of this name probably.) Small herbs with scaly-membranaceous stipules, with red or white flowers, mostly near the seacoast. Known also as Spergularia and Tissa. ① ♃ ?

B. rùbra, Dumort. Smoothish, prostrate in tufts; leaves thread-shaped; pod and pink-red corolla hardly equaling or exceeding the calyx; seeds rough, wingless, half-obovate. Common in sand or gravel, along roads and paths, E., quite away from salt water.

B. marìna, Dumort. Larger and more fleshy, only in brackish sands; with short pedicels, pale corolla; pod longer than the calyx, and rough, obovate-rounded (narrow-winged or wingless) seeds. Variable.

11. SPÉRGULA, SPURREY. (Latin: *spargo*, scatter, i.e. its seeds.) ①

S. arvénsis, Linn. Corn S. Stems 1° or so high, bearing several thread-shaped leaves in the whorls, and terminating in a panicle of white flowers. A weed in grainfields; cult. in Eu. as a forage plant for sheep.

XVII. PORTULACACEÆ, PURSLANE FAMILY.

Succulent-leaved herbs, with 2 sepals and 5 petals, the stamens sometimes many, sometimes few and then one before each petal; ovary 1-celled, becoming a pod, with many or few kidney-shaped seeds on a central placenta, or on slender seed-stalks from the base. Seeds as in the Pink Family.

* *Stamens more numerous than the petals; flowers opening only once, in sunshine.*

1. PORTULACA. Style cleft into several slender divisions. Lower part of the ovary and many-seeded pod united with the bottom of the calyx; the upper part when mature falling off as a lid. Leafy and branching, low and spreading, with fleshy, sessile leaves.
2. TALINUM. Style 3-lobed at the summit. Calyx free from the ovary, deciduous. Pod 3-valved, many-seeded.
3. CALANDRINIA. Style 3-cleft at the summit. Calyx free from the ovary, persistent, inclosing the 3-valved many-seeded pod.

* * *Stamens 5, one attached to the base of each petal; flowers opening for more than one day.*

4. CLAYTONIA. Style 3-cleft at the summit. Calyx persistent, free from the few-seeded pod. Low smooth herbs, ours producing only a pair of stem leaves and a short raceme of flowers. Stem simple, often from a round tuber.

1. **PORTULÀCA**, PURSLANE. (Old Latin name of unknown meaning.) Flowering all summer. (Lessons, Figs. 272, 404.) ①

P. oleràcea, Linn. Common P. Very smooth, with prostrate stems, obovate or wedge-shaped leaves, and small, sessile flowers opening only in bright sunshine and for a short time; the petals pale yellow. The commonest garden weed, sometimes used as a pot-herb. There is a cultivated form with much stronger and erect stems, and larger and lighter-colored leaves, excellent as a pot-herb. Eu.

P. grandiflòra, Lindl. Rose Moss. Cult. from S. Amer. and thriving in the hottest sand, bearing large and handsome red, yellow, or white flowers, single or double, and short terete leaves.

2. **TALÌNUM**. (Name unexplained.) One wild species in some places.

T. teretifòlium, Pursh. Terete-leaved T. Low and smooth, with thick and fleshy root; stems short; leaves crowded, linear, terete; peduncle slender, naked, many-flowered; petals pink; style equaling stamens. Rocks or sands Penn., W. and S. Flowering all summer. 2

3. **CALANDRÍNIA**. (Named for a Swiss botanist, *Calandrini*.) Cultivated for ornament in gardens; flowering all summer.

* *Erect* (1°–$1\frac{1}{2}^{\circ}$ *high*).

C. discolor, Schrad. Very glabrous, making a rosette of fleshy spatulate leaves at the root (these glaucous above and tinged with purple beneath), and sending up a naked flower-stem, bearing a raceme of large, rose-purple flowers, 2′ in diameter. Cult. as an annual, from Chile.

C. grandiflòra, Lindl. Somewhat woody; leaves mostly radical, fleshy, rhomboid; rosy flowers, 2′ diameter, in a loose, naked, raceme. A half-hardy annual from Chile.

* * *Low* (6′ *or less*) *and spreading.*

C. Menzièsii, Hook. Menzies' C. Leafy-stemmed; leaves bright green and tender, lance-spatulate; crimson flowers nearly 1′ broad, in a short, leafy raceme. Oregon and California. ①

C. umbellàta, DC. Leaves mostly radical, linear, acute, hairy; flowers purple-crimson, in a close corymb, 1′ diameter. ② Chile; half-hardy.

4. **CLAYTÒNIA**, SPRING BEAUTY. (Named for *John Clayton*, an early botanist in Virginia.) Low herbs, in rich land.

* *Stem simple from a round tuber; leaves separate.* 2

C. Virgínica, Linn. Spring Beauty. Leaves linear-lanceolate; flowers rose-color with pink veins. One of the prettiest of early spring flowers.

C. Caroliniàna, Michx. Broader-leaved S. Smaller than the preceding, with oblong-spatulate or lance-oblong leaves only 1′ or 2′ long. In rich woods; commonest N. and along the Alleghanies.

* * *Root fibrous; leaves connate under the cluster of small, whitish flowers.* ①

C. perfoliàta, Donn. From the Pacific Coast and Mexico and Cuba, with long-spatulate root-leaves, is grown somewhat as a salad plant.

XVIII. TAMARISCINEÆ, TAMARISK FAMILY.

Shrubs or small trees of the Old World, represented in ornamental grounds by

1. TÁMARIX, TAMARISK. (From the *Tamaris*, now *Tambre*, a small river of Spain.) Sepals and petals 4 or 5, persistent, or the latter withering, and stamens as many or twice as many, all on the receptacle. Ovary pointed, 1-celled, bearing many ovules on three parietal placentæ next the base; styles 3. Seeds with a plume of hairs at the apex. Shrubs or small trees of peculiar aspect, with minute and scale-shaped or awl-shaped, alternate leaves, appressed on the slender branches, and small white or purplish flowers in spikes or racemes. The one chiefly seen in this country is

T. Gállica, Linn. FRENCH T. Barely hardy N., often killed to the ground, a picturesque, delicate shrub, rather Cypress-like in aspect, glaucous-whitish, the minute leaves clasping the branches, nearly evergreen where the climate permits; parts of the flower in 5's; in spring.

XIX. HYPERICACEÆ, ST. JOHN'S-WORT FAMILY.

Leaves opposite, entire, simple, chiefly sessile, punctate with translucent and commonly with some blackish dots; perfect flowers with many or few stamens (usually in 3 or 5 clusters) inserted on the receptacle, and a pod either 1-celled with parietal placentæ or 3–7-celled (Lessons, p. 108, Figs. 335, 336), filled with many small seeds. Juice resinous and acrid.

* *No glands between the stamens. Petals convolute in the bud.*

1. ASCYRUM. Sepals 4; the outer pair very broad, the inner small and narrow. Petals 4, yellow. Stamens many. Ovary 1-celled. Leafy-stemmed, woody at base, with 2-edged branches.
2. HYPERICUM. Sepals and petals 5. Stamens many, rarely few, often united in 3–5 clusters. Herbs or shrubs, with cymose yellow flowers.

* * *Large gland between each of the 3 sets of stamens. Petals imbricated in the bud.*

3. ELODES. Sepals erect and flesh-colored. Petals 5. Stamens 9 to 12, united in 3 sets. Ovary 3-celled. Flowers in close, axillary clusters. Leaves pale, often purple-veined oblong or ovate, and produced all summer. Petals pale purple or flesh-color, equal-sided, erect. In water or wet bogs.

1. ÁSCYRUM, ST. PETER'S-WORT. (Greek: *without roughness.*) Wild in pine barrens, etc., chiefly S. Flowers summer. ♃

* *A pair of bractlets on the pedicel; styles short.*

A. stáns, Michx. COMMON ST. PETER'S-WORT. Stems 2°–3° high; leaves thickish, somewhat clasping, oval or oblong; flowers large, with obovate petals and 3 or 4 styles. From Long Island, S.

A. Crux-Andreæ, Linn. ST. ANDREW'S CROSS. Low; stems spreading; leaves thinnish, narrow-oblong and tapering to the base; flowers rather small, with linear-oblong, pale yellow petals; only 2 styles. From New Jersey to Illinois, W.

* * *Pedicels bractless; styles longer than the ovary; in Ga. and Fla.*

A. amplexicaùle, Michx. Shrub 2°–3° high, with cordate-ovate clasping leaves.

A. pùmilum, Michx. 6′ or less high, with oblong-ovate leaves.

2. HYPÉRICUM, ST. JOHN'S-WORT. (Greek: of unknown meaning.) Flowers in summer, mostly yellow. (Lessons, Figs. 328, 329, 335, 336, 396, 423.)

* *Stamens very numerous, in 5 clusters; styles* 5. 2

H. Áscyron, Linn. GREAT ST. JOHN'S-WORT. Strong woody herb (2°–5° high) with angled branches; leaves ovate-oblong and somewhat clasping; petals narrowly obovate, withering before they fall, 1′ long, showy. River banks. N. and W.

H. MOSERIÀNUM, a recent introduction to gardens, said to be a hybrid of the European species H. calycinum and H. patulum, is a very handsome woody herb, with large golden-yellow flowers 2′ across, the petals broad and more or less notched at the end, and the yellow stamens red-tipped.

* * *Stamens very numerous, scarcely clustered; styles* 3 *(except in the first), more or less united.* 2

+ *Bushy shrubs,* 1°–6° *high, leafy to the top.*

++ *Leaves deciduous; Northern and Southern.*

H. Kalmiànum, Linn. KALM'S S. Low shrub, with glaucous, linear to oblanceolate leaves, and flowers 1′ wide; stamens almost distinct; stigmas not capitate; pod ¼′ long. Wild at Niagara Falls and northern lakes. Also cult.

H. prolíficum, Linn. SHRUBBY S. Like the last, but leaves scarcely glaucous, lance-oblong or linear; pod ⅓′–½′ long. From N. J., west to Minn., and south.

H. densiflòrum, Pursh. Tall, 5°–6° high, very much branched above; flowers ½′–⅔′ wide; pods ⅛′–¼′ long. N. J. to Tex.

++ ++ *Evergreen or nearly so; Carolina and S.*

H. fasciculàtum, Lam. FASCICLED S. Leaves narrow-linear and small, and with shorter ones clustered in the axils; pod narrow. Wet pine barrens.

H. myrtifòlium, Lam. MYRTLE-LEAVED S. Leaves heart-shaped and partly clasping, thick, glaucous; pod conical. Wet pine barrens.

H. aùreum, Bartram. GOLDEN S. Leaves oblong with a narrow base, glaucous beneath; thick; flowers mostly single, very large (2′ broad), orange-yellow; pod ovate. River banks towards the mountains. Also cult.

H. nudiflòrum, Michx. NAKED-CLUSTERED S. Shrubby and evergreen S., less so in Virginia, etc., has 4-angled branches, oblong pale leaves, and a peduncled, naked cyme of rather small flowers; pods conical.

+ + *Herbs, sometimes a little woody at the base.*

++ *Pod incompletely* 3–4*-celled.*

H. galioìdes, Lam. Leaves linear-oblanceolate, narrowed downward and almost petioled; flowers small, in terminal and axillary cymes. Del. to Ga. and E. Tenn.

H. adpréssum, Barton. 1° high; leaves ascending, lanceolate, often acute; flowers few; stem angled. Low grounds, R. I., Penn., and Ga.

++ ++ Pod plainly 1-celled, with 3 parietal placentæ.

= Leaves very narrow.

H. dolabriförme, Vent. Branched from decumbent base 6′–20′ high; leaves linear-lanceolate, mostly acute; cyme few flowered, leafy; sepals oblong or ovate-lanceolate, ½′ long; pod ovate-conic, pointed. Ky. and Tenn.

H. cistifòlium, Lam. CISTUS-LEAVED S. Nearly simple, 1°–2° high; leaves diverging, oblong-linear (2′ long), mostly obtuse; flowers numerous, small, in a naked flat cyme; sepals ovate; pod globular. Rocky banks, O. to Iowa and S.

= = Leaves elliptic or nearly ovate.

H. ellípticum, Hook. ELLIPTICAL-LEAVED S. 10′–20′ high; leaves spreading, oblong, thin; flowers rather few, pale; sepals oblong; the pod purple, ovoid, very obtuse. Wet soil, N.

H. virgàtum, Lam. BRANCHY S. Wet pine barrens from New Jersey S. Stem sharply 4-angled (1°–2° high), smooth; leaves ovate or lance-oblong; flowers scattered along the ascending branches of the cyme, small, copper-yellow; styles slender.

H. pilòsum, Walt. HAIRY S. Wet pine barrens S. Stem terete, and with the lance-ovate leaves roughish-downy; styles short.

** * * Stamens many in 3 or 5 clusters; styles 3, not united; petals with black dots.* 2

H. perforàtum, Linn. COMMON S. Upright stems branching; leaves oblong or linear-oblong, with pellucid dots; flowers rather large, in open leafy cymes; the deep yellow petals twice the length of the lanceolate, acute sepals; juice very acrid. Nat. from Eu., a troublesome weed in fields, etc.; spreads by runners from the base.

H. maculàtum, Walt. SPOTTED S. Stem 2° high, sparingly branched; leaves oblong, slightly clasping, having black as well as pellucid dots; flowers rather small, crowded; petals light yellow and black-lined as well as dotted; sepals oblong; styles not longer than the pod. Common.

** * * * Stamens definite (5–12), distinct or in 3 clusters; styles 3, not united; stems 4-angled.* ①

+– Leaves conspicuous and spreading; flowers in cymes.

H. mùtilum, Linn. SMALL S. Slender, much-branched and leafy up to the flowers, 6′–20′ high; leaves partly clasping, thin, 5-nerved, ovate or oblong; petals pale yellow. Common in low grounds.

H. gymnánthum, Engelm. & Gray. Stem almost simple, strict, 1°–3° high; leaves clasping, the floral ones reduced to awl-shaped bracts.

H. Canadénse, Linn. Stem and branches strictly erect; leaves linear or lanceolate, 3-nerved at the base; petals copper-yellow. Wet sandy soil.

+– +– Leaves erect, awl-shaped or scale-like and minute; flowers very small and scattered along the numerous bushy and wiry slender branches.

H. Drummóndii, Torr. & Gray. Leaves linear-awl-shaped; flowers short-pediceled; pods not longer than the calyx. Ill., W. and S.

H. nudicaùle, Walt. ORANGE GRASS or PINEWEED. Leaves reduced to minute, awl-shaped, appressed scales; flowers sessile on the wiry branches; slender pods much exceeding the calyx. Common in dry, sterile soil.

3. ELÒDES, MARSH ST. JOHN'S-WORT. (Greek: *marsh.*) 2

E. campanulàta, Pursh. 1°–2° high; leaves closely sessile or clasping by a broad base; filaments united below the middle. Swamps.

E. petiolàta, Pursh. Taller; leaves tapering into a short petiole; filaments united beyond the middle. Va., S. and W.

XX. TERNSTRŒMIACEÆ, CAMELLIA or TEA FAMILY.

Trees or shrubs, with alternate, simple, feather-veined leaves, and no stipules; the flowers large and showy, mostly axillary, regular, with both sepals and petals imbricated in the bud; the very numerous stamens with filaments more or less united at the base with each other and with the base of the corolla; ovary 5–∞-celled, with one or more seeds in each cell. Petals 5 or 6 or even more, commonly more or less united at their base.

* *Woody climber; styles many; fruit a berry.*

1 ACTINIDIA. Ovary many-celled; the styles as many and divergent from their base. Seeds small. Leaves bristly hairy, thin.

* * *Erect shrubs or trees; styles* 1–5; *fruit a woody dehiscent pod.*

\+ *Some of the inner stamens distinct.*

2. CAMELLIA. Style 3-5-cleft. Seeds large, usually single in each cell of the thick and woody pod. Leaves smooth, evergreen, serrate.

\+ \+ *Stamens all united at the base.*

3. STUARTIA. Stamens uniformly united by a short ring at the base of the filaments. Seeds 2 in each cell, wingless. Leaves thin and deciduous. Flowers white, 2′–4′ wide.

4. GORDONIA. Stamens in 5 clusters, on a cup on the white petals. Style columnar; stigma 5-rayed. Seeds several, more or less winged. Leaves coriaceous or thickish.

1. ACTINIDIA. (Greek: *a ray*, from the radiate styles.)

A. polýgama, Planch. Leaves elliptic, acuminate; flowers solitary or as many as 3 together, white, fragrant, 1′ wide; berry edible. Japan.

2. CAMÉLLIA. (For *G. Camellus*, or *Kamel*, a missionary to China in the 17th cent.)

* *Numerous separate inner stamens within the ring formed by the united bases of the outer.*

C. Japónica, Linn. JAPAN CAMELLIA. With oval or oblong, pointed, shining, sharply serrate leaves, and terminal or nearly terminal flowers, simple or double, red, white, or variegated, of very many varieties. The only common species; flowers through the winter, hardy only S.

C. Sasánqua, Thumb. Leaves obtusely serrate, and flowers smaller.

C. reticulàta, Lindley. Differs from the preceding in having acuminate, veiny leaves, not shining, and flowers rose-red, to 9′ wide.

* * *Separate inner stamens, as many as the petals* (5 *or* 6).

C. Thèa, Link. TEA PLANT. Leaves oblong or broadly lanceolate, much longer than wide; the white flowers (1′ or more broad) nodding on short stalks in their axils. Includes T. VIRIDIS and T. BOHEA.

3. STUÁRTIA. (Named for *John Stuart*, the *Lord Bute* at the time of the American Revolution.) Ornamental shrubs.

* *Style* 1; *pod not sharply angled.*

S. Virgínica, Cav. Shrub 8°–12° high, with finely serrate leaves soft-downy underneath, pure white petals, purple stamens; pod globular. Low country, from Va., S.

S. Pseudo-Camélliа, Maxim. (or S. GRANDIFLÒRA). Leaves smooth, 2′–3′ long; flowers 2′ wide; the serrate sepals and erose petals densely silky-hairy outside; anthers orange; pod ovoid. Japan. Hardier N. than the native species.

* * *Styles* 5; *pod sharply* 5-*angled and pointed.*

S. pentágyna, L'Her. Leaves smooth, 5′–6′ long, and very handsome flowers, their petals (often 6) jagged-edged and tinged with cream-color, the sepals often reddish outside; orange anthers. Mts. of Ky., Car., and S. Cult. Hardy N.

4. **GORDÒNIA.** (Named for *Dr. Gordon* and a London nurseryman of the same name.)

G. Lasiánthus, Linn. LOBLOLLY BAY. Usually a small tree, but reaching 60°–75°; leaves evergreen and smooth lance-oblong, tapering to the base and minutely serrate; flowers 2′–3′ across, white, in summer on slender peduncles; stamens short, on a 5-lobed cup; pod pointed. Swamps near the coast from Va., S., rarer W. Also cult.

G. pubéscens, L'Her., also called FRANKLÍNIA, after *Dr. Franklin.* A tall, ornamental shrub or small tree, with thinner and deciduous lance-obovate leaves, whitish-downy beneath; flowers on short, stout peduncles in autumn; stamens directly on the petals; pod globular. Native of Ga., but no longer known wild.

XXI. MALVACEÆ, MALLOW FAMILY.

Known by the monadelphous numerous stamens, their tube connected with the base of the petals, kidney-shaped, 1-celled anthers (Lessons, Figs. 286, 298), the calyx valvate, and the corolla convolute in the bud. Herbs or shrubs, with alternate, palmately veined and often lobed leaves, evident stipules, and regular flowers, the true sepals and the petals 5. There is commonly an involucre of several bracts resembling an outer calyx. Seeds kidney-shaped; the leafy cotyledons crumpled or doubled up in some mucilaginous albumen. Innocent plants, mucilaginous, with a very tough fibrous bark.

§ 1. *Anthers all borne in a cluster at the top of the short tube of filaments.*

* *Ovaries numerous and separate, crowded in a head, in fruit becoming little* 1-*seeded pods or akenes. Involucel conspicuous as a sort of outer calyx. Herbs.*

1. MALOPE. Involucel of 3 ovate or heart-shaped leaves. Annuals.

* * *Ovaries several or many united in a ring around an axis, in fruit commonly falling away separately, each* 1-*seeded. Ours are all herbs.*

\+ *Stigmas running down the side of the slender styles.*

2. ALTHÆA. Involucel of 6–9 bracts united at the base. Axis of the fruit not projecting or enlarged.

3. MALVA. Involucel of only 3 separate bracts. Petals obcordate, otherwise entire. Carpels beakless.

4. CALLIRRHOE. Involucel of 1–3 bracts or none. Petals wedged-shaped and truncate, denticulate, or cut-fringed at the end. Carpels with a sort of beak at the summit. Flowers crimson, mauve, or red-purple, very showy.

5. NAPÆA. Involucel none. Flowers dioecious. Carpels beakless.

+ + Stigmas capitate or truncate at the apex of the styles.

6. MALVASTRUM. Involucel of 2–3 bractlets or 0. Seed ascending. Otherwise as Sida.

7. SIDA. Involucel none. Fruit separating into 5 or more closed carpels, or each 2-valved at the apex; seed hanging. Mostly rather small-flowered or weedy herbs, with 5–12 styles and carpels.

** * * Ovaries and cells of the fruit 2-several-seeded.*

8. ABUTILON. Involucel none. Carpels each 3–several-seeded. Flowers mostly large.

9. MODIOLA. Involucel of 3 bractlets. Carpels each 2-seeded, with a cross-partition between the upper and lower seed.

§ 2. *Anthers borne along the outside of the tube of filaments. Ovary and fruit 3-several-celled; stigmas capitate. Involucel present. Herbs, shrubs, or trees.*

** Involucel of several or many bracts.*

10. KOSTELETZKYA. Branches of the style and stigmas 5. Pod 5-celled; the cells single-seeded.

11. HIBISCUS. Branches of the style or stigmas and cells of the ovary 5. Pod 5-celled, loculicidal; the cells many-seeded.

** * Involucel of 3 large and heart-shaped leaf-like bracts.*

12. GOSSYPIUM. Styles united into one; stigmas 3–5, as many as the cells of the pod. Seeds numerous, bearing cotton.

1. MÁLOPE. (Ancient Greek name for some kind of Mallow.) Herbs, resembling Mallows, cult. from the Mediterranean region; flowers summer.

M. trífida, Cav. THREE-LOBED M. Smooth, with rounded leaves, the upper ones 3-lobed; the handsome flowers 2′ or more broad, rose-color, veined with purple or rose-red, also a white variety. ① Cult. as M. GRANDIFLÒRA.

2. ALTHÆA. (Greek: *to cure;* used as an emollient.) Tall herbs (the *Shrubby Althæa* belongs not to this genus, but to Hibiscus), natives only of the Old World; flowers summer and autumn.

A. officinàlis, Linn. MARSH MALLOW. Rather coarse, downy; leaves ovate, sometimes a little heart-shaped or 3-lobed, with clusters of short-peduncled flowers in their axils; corolla 1′ broad, rose-color. The thick root is used for its mucilage, and for making *Marsh Mallows.* 2↓ Rarely cult., but has run wild.

A. ròsea, Cav. HOLLYHOCK. Stem tall and simple, hairy; leaves rugose, rounded, and heart-shaped, angled, or 5–7-lobed; large flowers on very short peduncles, forming a long spike; corolla of all shades of rose, purple, white, or yellow, single or double, 3′–4′ broad. ② 2↓ Cult. from the Levant.

3. MÁLVA, MALLOW. (Latin alteration of Greek: *soft* or *emollient.*) All from Europe or the Orient, but several have run wild in fields and along roadsides; flowers all summer and autumn. (Lessons, Fig. 346.)

** Flowers small, white or whitish, not conspicuous or handsome.*

M. rotundifòlia, Linn. COMMON M., CHEESES. Weed in cult. grounds; stems procumbent from a strong deep root; leaves rounded kidney-shaped, crenate on very long petioles; peduncles rather slender. ② 2↓

M. crispa, Linn. CURLED M. Cult. for foliage and sparingly in waste places; stem erect (4°–6° high), leafy to the top; leaves rounded 5–7-lobed or angled, very much crisped round the margin: flowers clustered and almost sessile in the axils. ①

* * *Flowers larger, more or less showy, 1½′–2′ in diameter; the purple, rose-color, or sometimes white petals much exceeding the calyx; stem erect.*

M. sylvéstris, Linn. High M. Stem 2°–3° high, rough-hairy, branching, with rather sharply 5–7-lobed leaves and purple-rose-colored flowers; fruit wrinkled-veiny. ② 2ℓ Gardens and roadsides. Var. ***Mauritiàna,*** sometimes called Tree Mallow. Cult.; taller, smoother, with obtusely-lobed leaves.

M. Álcea, Linn. 2°–4° high, hairy; stem leaves parted almost to the base into 3–5 divisions, which are again 3–5-cleft or cut-toothed; corolla deep rose-color, 1½′–2′ broad; calyx densely stellate-pubescent; fruit glabrous, minutely wrinkled-veiny. 2ℓ Gardens, and escaped.

M. moschàta, Linn. Musk M. 1°–2° high, rather hairy; leaves about thrice parted or cut into slender linear lobes; corolla 1½′ broad, rose-color or white; calyx with simple hairs; fruit downy, not wrinkled. Gardens, and escaped to roadsides.

4. CALLÍRRHOË. (A Greek mythological name.) Flowers all summer.

* *Root thick, fusiform or napiform, farinaceous.* 2ℓ *(some ②?)*

+– *Calyx 5-lobed to middle; involucel 3-leaved; short peduncles umbellately few–several-flowered; stipules small; carpels plain.*

C. triangulàta, Gray. Stems erect, 2° high; leaves triangular, halberd-shaped, or the lowest heart-shaped, the upper cut-lobed or 3–5-cleft; corolla 1½′ or less in diameter. Dry prairies, Minn. to Ind. and S.

+– +– *Calyx 5-parted; involucel 3-leaved; peduncles long, 1-flowered; stipules conspicuous, ovate; carpels wrinkled.*

C. involucràta, Gray. Stems spreading on the ground, 1°–3° long; leaves rounded, 5-parted or cleft and cut-lobed; corolla 2′ or more broad. Wild, Minn. to Tex.; cult. for ornament.

+– +– +– *Calyx 5-parted; involucel 0 (or 1–3-leaved in the second), and stipules small; carpels rugose or wrinkled.*

C. alcæoìdes, Gray. Stems 1° high; lower leaves triangular-heart-shaped, upper 5–7-parted or divided into linear segments; flowers corymbose. Ky. and Tenn., W.

C. Papàver, Gray. Stems short, ascending, few-leaved; leaves 3–5-parted with lance-linear divisions, or the lowest rather heart-shaped and cleft into oblong lobes; flowers solitary; peduncles very long (often 1°). Ga. to Tex., and sparingly cult.

C. digitàta, Nutt. 1° high; leaves mostly from the root, 5–7-parted into long, linear, sometimes 2–3-cleft divisions; flowers solitary on long and slender peduncles; petals fringe-toothed at the end. Wild Kans. to Tex.

* * *Root slender or tapering; involucel 0; carpels even.* ①

C. pedàta, Gray. Stem erect, 1°–5° high, leafy; leaves rounded, 3–7-lobed or parted, and the wedge-shaped divisions cleft or cut; peduncles slender, longer than the leaves; petals minutely eroded at the end. Texas; not rare cult.

5. NAPÆA, GLADE MALLOW. (Greek: *glade* or *nymph of the groves.*)

N. diòica, Linn. A rather coarse, roughish herb; stem 4°–7° high; leaves 9–11-parted and their lobes cut and toothed, the lowest often 1° in diameter; flowers small, in panicled corymbs, in summer. Penn., Va., and W. to Iowa.

6. MALVÁSTRUM, FALSE MALLOW. (Name altered from *Malva*.)

M. angústum, Gray. Erect; leaves lance-oblong or linear; flowers yellow, on axillary peduncles. ① Tenn. and Ill., W.

M. coccíneum, Gray. Low, hoary; leaves 5-parted or pedate; flowers red in short spikes or racemes. ♃ Minn. to Tex. and W.

7. SÌDA. (A name used by Theophrastus.) Flower summer and autumn.

* *Peduncles bearing a corymb of several white flowers from the upper axils.*

S. Napæa, Cav. Smooth; stem simple, 4°–7° high; leaves rounded, 5-cleft, the lobes toothed and taper-pointed; corolla about 1′ broad; styles and cells of the pod 10. Rocky banks, Penn. and Va. Rare, but cult. in old gardens. ♃

* * *Peduncles axillary, 1-flowered; corolla yellow.*

S. spinòsa, Linn. Stems much branched, 10′–20 high; leaves lance-ovate, serrate, minutely soft-downy; peduncles very short; flower very small; pod ovate, of 5 carpels, each splitting at top into 2 points. A common weed S. and W. ① ② Tropics.

S. Ellióttii, Torr. & Gray. Nearly smooth, 1°–4° high; leaves linear or lanceolate, serrate, short-petioled; flower 1′ broad, on a short peduncle; fruit of 10–12 nearly blunt carpels. Woodlands S. ♃

S. rhombifòlia, Linn. Leaves usually lance-oblong, short-petioled, serrate, pale and whitish downy beneath; stems 1°–3° high, much branched; peduncles rather long; flower small; fruit of 10 or 12 one-pointed carpels. A weed, only S. ①

S. stipulàta, Nutt. Weed far S., has leaves and branches 2-ranked; leaves lance-oblong and acute, linear-subulate, stipules longer than the petioles, and yellow flowers at midday, single or clustered on peduncles 3–4 times as long as the petioles. ① or ♃

8. ABÙTILON, INDIAN MALLOW. (Origin of name obscure.)

* *A naturalized weed; petals small, widely spreading.*

A. Avicénnæ, Gærtn. VELVET LEAF. 3°–5° high; leaves roundish, heart-shaped, taper-pointed, soft-velvety; peduncles shorter than petiole, 1–3-flowered; corolla orange-yellow; fruit of 12–15 united hairy carpels with spreading beaks; flowers autumn. ① India.

* * *Tender cultivated shrubs; flowers large.*

+– *Corolla not spreading open widely; plant smooth.*

+– *Leaves lobed or parted.*

A. striàtum, Dicks. STRIPED ABUTILON. Leaves rounded, heart-shaped, 3-lobed, the lobes very taper-pointed; flowers solitary, hanging on a very long and slender peduncle; corolla orange-colored, with deeper or brownish veining or stripes. Leaves often spotted. Brazil.

A. venòsum, Lem. Tall shrub; leaves palmately 7–9-parted, the lobes distantly toothed; flowers solitary, 3′ long, hanging on stalks a foot long, orange with red veins. Mexico.

+– +– *Leaves not lobed.*

A. vexillàrium, Morren. Leaves long-ovate and cordate, coarsely toothed; flowers rather small, cylindrical, pendulous, the calyx dark red, projecting petals pale yellow, and column of stamens dark brown, very handsome. Probably from tropical America.

+– +– Corolla spreading, bell-shaped; plant pubescent.

++ Leaves lobed.

A. Darwíni, Hook. Densely velvety-pubescent; leaves 5–9-ribbed, lower palmately 5–7-lobed to the middle; flowers 1–3 in the axils, dark orange-red with blood-red veins. Brazil.

++ ++ Leaves not lobed.

A. insígne, Planch. Young branches and calyx reddish-brown with stellate hairs; leaves broad, cordate, coarsely serrate, with prominent veins; flowers in axillary, few-flowered racemes, purplish-crimson with darker veins. New Granada.

9. MODÌOLA. (The shape of the depressed fruit likened to the Roman measure *modiolus.*) Procumbent or spreading, small-flowered, weedy plants.

M. multífida, Moench. Va. and S., in low grounds; leaves 3–7-cleft and cut, or the earlier ones rounded and undivided; flowers red, ½′ broad; fruit hairy at the top. ② 2

10. KOSTELÉTZKYA. (For *Kosteletzky*, a Bohemian botanist.)

K. Virgínica, Gray. Virginian K. Roughish-hairy, 2°–5° high; leaves heart-shaped or mostly 3-lobed, often halberd-shaped; flowers (in summer) somewhat racemed or panicled, rose-purple, 2′ broad. Salt marshes, N. Y., S. 2

11. HIBÍSCUS, ROSE MALLOW. (Ancient name, of obscure origin.) Flowers showy, usually large, in summer and autumn.

** Tall shrubs or even trees; exotics.*

H. Syrìacus, Linn. Shrubby Althæa. Leaves nearly smooth, wedge-ovate, and 3-lobed; flowers short-peduncled in the axils, in autumn, about 3′ broad, purple, rose-color, white, etc., often double. Levant; common in gardens and grounds.

H. Rosa-Sinénsis, Linn. Chinese H. or Rose of China. Very smooth; leaves bright green, ovate and pointed, somewhat toothed; flowers on slender peduncles, very showy, 4′ or 5′ broad, scarlet-red (rarely rose-purple or even white), often double. Cult. in conservatories from China.

** * Herbs, with persistent and regular, 5-lobed calyx, and a short pod.*

+– Wild species, but sometimes cultivated; tall and large. 2

++ Entirely glabrous.

H. coccíneus, Walt. Great Red H. or R. 4°–7° high; leaves 5-parted or deeply cleft into long, lanceolate and taper-pointed divisions; bright-red corolla 6′–11′ broad; petals narrow below. Wild in swamps near coast, Ga. and Fla.; cult.

H. militàris, Cav. Halberd-leaved R. 3°–4° high; leaves ovate or heart-shaped, toothed or 3-lobed, some of them halberd-shaped; peduncles slender; calyx inflated; corolla flesh-colored, 4′–5′ broad. Penn. to Minn. and S.

++ ++ Leaves downy beneath, often also on top.

H. aculeàtus, Walt. Prickly R. In swamps, S. C., S. and W., has the involucel leaves lobed, round-cordate 3–5-lobed leaves, hoary beneath, yellow purple-centered flowers, and hispid stems.

H. Moscheùtos, Linn. Swamp R. 3°–7° high; the ovate, pointed, and often 3-lobed leaves hoary beneath, generally smooth above; pedun-

cles slender; corolla 4′–6′ broad, pale rose or white, with or without a darker center; pod smooth. Swamps, mostly brackish, near the Great Lakes E. and coastwise to Tex.

H. lasiocárpus, Cav. Hairy-fruited R. Like the last, but leaves soft-downy both sides, and pod velvety-hairy. Swamps, Ill. to Tex., E. to Ga.

H. Californicus, Kellogg. Californian R. Has large white flowers with a purple center on jointed peduncles, young leaves and growth velvety, and cordate-acuminate rarely obscurely 3-lobed, crenate or dentate leaves, longer than the petiole. Cult.

\+ \+ *Exotic low species, in gardens or escaped.* ①

H. Triònum, Linn. Bladder Ketmia or Flower-of-an-hour. Rather hairy, 1°–2° high; leaves toothed, or the upper 3-parted into lanceolate lobes, the middle lobe longest; calyx inflated and bladdery; corolla about 2′ broad, sulphur-yellow with a blackish eye, open only in midday sunshine.

* * * *Herbs, with calyx splitting down one side, and generally falling off at once, and with long or narrow pyramidal or angled pod; native of East Indies.*

H. esculéntus, Linn. Okra or Gombo. Nearly smooth; leaves rounded heart-shaped, 5-lobed, toothed; greenish-yellow flowers on slender peduncle (involucel falling early); pods narrow, 3′ or 4′ long, very mucilaginous, and when green cooked and eaten, or used to thicken soups. Cult. ①

12. **GOSSÝPIUM**, COTTON. (Name given by Pliny, from the Arabic.) Plants now diffused over warm countries, most valuable for the wool on the seeds; the species much confused.

G. herbàceum, Linn. Common Cotton. Leaves with 5 short and roundish lobes; petals pale yellow or turning rose-color, purple at base. ① Cult. S.

G. Barbadénse, Linn. Barbadoes or Sea-Island C. Inclining to be shrubby at base; branches black-dotted; leaves with 5 longer lance-ovate and taper-pointed lobes; leaves of the involucre with very long and slender teeth; petals yellowish or whitish, with purple base. Cult. on the coast and upland S.

G. arbòreum, Linn. Tree C. Leaves with 5–7 nearly lanceolate and taper-pointed lobes of involucre, slightly toothed; corolla purple with a darker center. Cult. S. as a curiosity.

XXII. STERCULIACEÆ, STERCULIA FAMILY.

Chiefly a tropical family, to which belongs the Theobroma or Chocolate Tree; in common cultivation known here only by a single species of

1. **MAHÉRNIA**. (Name an anagram of *Hermannia*, a genus very like it.) Calyx, corolla, etc., as in the Mallow Family; but the stamens only 5, one before each petal; the filaments monadelphous only at the base and enlarged about the middle, and the anthers with 2 parallel cells. The edges of the base of the petals rolled inwards, making a hollow claw. Ovary 5-celled, with several ovules in each cell; styles 5, united at the base.

***M. verticillàta*, Linn.** (Sometimes called M. ODORÀTA.) Cult. from Cape of Good Hope, in conservatories, producing a succession of honey-yellow, sweet-scented small blossoms, on slender peduncles, all winter and spring; a sort of woody perennial, with slender and spreading or hanging roughish branches and small irregularly pinnatifid leaves; the specific name given because the leaves seem to be whorled; but this is because the stipules, which are cut into several linear divisions, imitate leaves.

XXIII. TILIACEÆ, LINDEN FAMILY.

Trees (rarely herbs) with the mucilaginous properties, fibrous bark, valvate calyx, etc., as in the Mallow Family; but sepals deciduous; petals imbricated; stamens in several clusters, and anthers 2-celled. Chiefly a tropical family, represented here only by an herbaceous CORCHORUS on our southernmost borders, and by the genus of fine trees which gives the name:

1. TÍLIA, LINDEN, BEE TREE, BASSWOOD. (The old Latin name.) Sepals 5; petals 5, spatulate-oblong. Stamens numerous; their filaments cohering in 5 clusters or with a petal-like body before the true petal. Ovary 5-celled with 2 ovules in each cell; fruit rather woody, globular, 1–2-seeded. Style 1. Stigma 5-toothed. Trees with tough inner bark (*bast*), soft white wood, alternate roundish and serrate leaves more or less heart-shaped, and commonly oblique at the base, deciduous stipules, and a cyme of small, dull cream-colored, honey-bearing flowers, borne in early summer on a nodding axillary peduncle which is united to a long and narrow leaf-like bract. (Lessons, Figs. 181, 277, 289, 414.)

* *Stamens united with a petaloid body.*

+– *Fruit even, not ribbed or lobed; native species.*

T. Americàna, Linn. Large leaves of rather firm texture and smooth or smoothish both sides; bract tapering at base; fruit oval. N. B. to N. Dak., S. to Ga. The common species.

T. pubéscens, Ait. Under side of the leaves and the young shoots covered with reddish pubescence; bract rounded at base; fruit globular. N. Y. to Fla., W. to Tex.

T. heterophýlla, Vent. Leaves smooth and bright green above, silvery white with a fine down underneath; bract tapering at base; fruit globose. Penn., S. and W.

+– +– *Fruit ribbed or lobed; planted, from Eu.*

***T. argéntea*,** DC. SILVER LINDEN. Leaves smooth above, white-downy beneath, 2–4 times as long as the petiole; fruit ovoid, acute, 5-ribbed, or angled. Many forms. Commonly known as T. ÁLBA.

* * *Stamens not attached to petaloid scales. Natives of Eu.*

***T. Europæa*,** Linn. EUROPEAN L. Glabrous except for tufts of pale hairs in the axils of veins on the under side of leaves; fruit oval or nearly round, densely tomentose.

***T. dasystỳla*,** Stev., with dark green shining leaves, fruit obovoid, prominently 5-ribbed, is beginning to be planted.

XXIV. LINACEÆ, FLAX FAMILY.

Herbs (rarely shrubs) with regular and symmetrical flowers; sepals 5, imbricated; petals 5, convolute; stamens 5, their filaments united at the base; ovary with as many cells as there are styles; pod with twice as many, through the growth of a false partition.

1. LINUM. Seeds with a mucilaginous coat and a large, straight, oily embryo; styles and cells of the ovary 5; leaves simple, nearly sessile, narrow, and entire; stipules 0, or gland-like; flowers (Lessons, p. 11, Figs. 1–4, p. 14, Figs. 9 and 10, p. 95, Fig. 270, and p. 98, Fig. 281) usually opening for only one day and in sunshine, all summer. Hardy. ⓓ or ♃
2. REINWARDTIA. Styles and cells of the ovary 3–4; leaves broad; stipules minute, awl-shaped, falling early. Greenhouse shrubs, with showy yellow flowers.

1. LÌNUM, FLAX. (The classical name.) Ours are slender herbs, with flowers (often minute) of short duration.

* *Wild species, annuals or scarcely perennials, with yellow flowers.*
+ *Sepals and bracts entire.*

L. Virginiànum, Linn. The commonest WILD FLAX in dry woods, 2° high, spreading or recurving branches, terete and even; leaves oblong or lanceolate, only the lower spatulate and opposite; flowers scattered; styles distinct; pod little larger than a pin's head.

L. Floridànum, Trelease. Found in Ill., Va., and S., is more strict, with broadly ovate and obtuse pods.

L. striàtum, Walt. Like the first; but has the branches short and sharply 4-angled, with intermediate grooves (whence the name); most of the stem-leaves opposite and oblong; flowers more crowded. Wet grounds, Mass. and Can., S.

+ + *Sepals and bracts conspicuously serrulate with glandular-bristly edges.*

L. sulcàtum, Riddell. Branches upright, grooved; leaves linear and scattered; a pair of dark glands in place of stipules; sepals sharp-pointed, 3-nerved; styles united half-way up. Dry soil, Mass. to Minn. and S. W.

L. rígidum, Pursh. Usually low, glaucous; branches rigid; calyx finally falling off; the flowers rather large. Miss. River, W.

* * *Cultivated, hardy, herbaceous, with largish handsome flowers.*

L. usitatíssimum, Linn. COMMON FLAX. Leaves narrow-lanceolate; flowers corymbose, rich blue; sepals pointed, ciliate; stigmas slender, club-shaped. ① Old World, and inclined to run wild. Extensively cult. for the seeds and fiber.

L. perénne, Linn. PERENNIAL FLAX. Narrower leaved; sepals blunt, sometimes erose, but not ciliate; petals sky-blue, but there are pink and white forms; stigmas oblong-capitate. ♃ Cult. from Eu. in some varieties for ornament; a variety also native beyond the Mississippi.

L. grandiflòrum, Desf. RED FLAX. 1° high, with linear or lanceolate leaves and showy, crimson-red flowers; sepals and bracts ciliate-serrulate. ① ♃ Cult. as a hardy annual; from North Africa.

2. REINWÁRDTIA. (For *K. G. K. Reinwardt*, a botanist of Leyden in the early part of this century.) ♃

R. trigỳna, Planch. Leaves mostly obtuse, elliptic-obovate, entire or serrulate; styles 3. R. TETRAGỲNA, with acuminate leaves and 4 styles, is probably a variety of the preceding. India.

XXV. GERANIACEÆ, GERANIUM FAMILY.

As now received, a large and multifarious order, not to be characterized as a whole in any short and easy way, including as it does Geraniums, Nasturtiums, Wood Sorrels, Balsams, etc.,which have to be separately described.

§ 1. *Flowers regular; leaves simple, variously lobed or even dissected; glands of the disk* 5, *alternate with the petals. Herbs.*

* *Sepals imbricate; ovary* 5*-celled,* 10*-ovuled; fruit dehiscent, the* 1*-seeded carpels splitting elastically from a prolonged axis.* (Lessons, Figs. 358, 359.)

1. GERANIUM. Flowers 5-merous; sepals usually slender-pointed; stamens with anthers 10 (rarely 5); the recurving bases of the styles or tails of the carpels in fruit naked inside. Leaves with stipules. Herbage scented.
2. ERODIUM. Stamens with anthers only 5. Styles when they split off from the beak, bearded inside, often twisting spirally; otherwise as Geranium.

* * *Sepals valvate; ovary* 5*-celled,* 5*-ovuled; the carpels fleshy and indehiscent, breaking away from a very short axis; leaves pinnately divided.*

3. LIMNANTHES. Sepals and petals 5, the latter convolute in the bud. Stamens 10, separate at the base. Style 1, 5-lobed at the apex, rising from the center of the 5 ovaries, which in fruit become thickish and warty nutlets.
4. FLŒRKEA. Sepals, small petals, stigmas, and lobes of the ovary 3; and stamens 6; otherwise like Limnanthes.

§ 2. *Flowers regular; leaves compound, of* 3 *obcordate leaflets; disk glands* 0. *Herbs.*

5. OXALIS. Sepals and petals 5, the former imbricated, the latter convolute in the bud. Stamens 10, monadelphous at base, the alternate ones shorter. Styles 5, separate on a 5-celled ovary, which becomes a membranaceous several-seeded pod. Juice sour and watery. Flowers usually open only in sunshine.

§ 3. *Flowers somewhat irregular, Geranium like, the base of one sepal extending downward on one side of the pedicel, forming a narrow tube or adherent spur. Shrubby or fleshy stemmed.*

6. PELARGONIUM. Sepals and petals 5; the two petals on the upper side of the flower differing from the rest more or less in size or shape. Stamens with anthers fewer than 10, commonly 7. Pistil, etc., as in Geranium. Herbage scented. Leaves with stipules.

§ 4. *Flowers very irregular, and unsymmetrical; spur free. Tender herbs.*

7. TROPÆOLUM. Sepals 5, united at the base, and on the upper side of the flower extended into a long, descending spur. Petals 5, or sometimes fewer, usually with claws; the two upper more or less different from the others and inserted at the mouth of the spur. Stamens 8, unequal or dissimilar; filaments usually turned downwards and curving. Ovary of 3 lobes surrounding the base of a single style, in fruit becoming 3 thick and fleshy closed, separate carpels, each containing a single large seed. Herbs, often climbing by their long leafstalks; the watery juice with the pungent odor and taste of Cress. Leaves alternate; stipules none or minute. Peduncles axillary, 1 flowered.
8. IMPATIENS. Sepals and petals similarly colored, the parts belonging to each not readily distinguished. There are 2 small outer pieces, plainly sepals, on the sides of the flower; then below (as it hangs, but really on the upper side) a third sepal form-

ing a large sac contracted at the bottom into a spur or little tail; opposite the sac is a notched petal, and within are 2 small, unequally 2-lobed petals, one each side of the sac; these each represent 2 united petals. Stamens 5, short, conniving or lightly cohering around and covering the 5-celled ovary, which in fruit becomes a several-seeded pod; this bursts elastically, flying in pieces at the touch, scattering the seeds, separating into 5 twisting valves and a thickish axis. Style none. Seeds rather large. Erect, branching, succulent-stemmed herbs, with simple leaves and no stipules.

1. GERÀNIUM, CRANESBILL. (Greek: *crane*, alluding probably to the long beak in fruit.) The so-called Geraniums of cultivation belong to Pelargonium. Flowers spring and summer.

* *Flowers large* (1′ *or more across*) *and showy; perennial.*

+ *Peduncles 2-flowered and more or less clustered at the top of the stem.*

G. maculàtum, Linn. WILD CRANESBILL. Stem erect from a stout rootstock, hairy, branching, and terminating in long peduncles bearing a pair of flowers; leaves palmately parted into 5–7 wedge-shaped divisions cut and cleft at the end, sometimes whitish-blotched; petals wedge-obovate, light purple, ½′ long, bearded on the short claw; calyx sparsely hairy. Common in woodlands and open grounds.

G. Ibèricum, Cav. IBERIAN OR SPANISH C. Leaves firm and lighter below, roundish and cut into 5–7-toothed or lobed divisions; flowers blue or violet, with notched or trifid petals, and villous calyx. Cult. from Spain.

+ + *Peduncles 1-flowered, axillary.*

G. sanguíneum, Linn. BLOOD C. Stems diffuse (1°–2° high) with many opposite rounded leaves which are divided into 5–7 parts, these again 3-lobed into linear divisions; flowers red, on long solitary bracted peduncles, pretty. Cult. from Eu.

* * *Flowers small, pink; annual or biennial.* (*Besides the two below, which are native, several European species are sparingly introduced as weeds.*)

G. Robertiànum, Linn. HERB ROBERT. Diffusely spreading, very strong-scented, loosely hairy; leaves finely cut, being divided into 3 twice-pinnatifid divisions; flowers small; petals pink or red purple. Common N. in shady rocky places.

G. Caroliniànum, Linn. Stems erect or soon diffusely branched from the base, 6′–18′ high; leaves palmately parted into 5 much cleft and cut divisions; peduncles and pedicels short; flowers barely half as large as in the foregoing, the pale, rose-colored petals notched at the end. Common in open and mostly barren soil.

2. ERÒDIUM, STORKSBILL. (Greek: *a heron.*)

E. cicutàrium, L'Her. COMMON S. Low, hairy, and rather viscid; the leaves mostly from the root, pinnate; the leaflets finely once or twice pinnatifid; peduncle bearing an umbel of several small pinkish flowers in summer. ① Nat. from Eu., N. Y., Penn., etc., but not common.

3. LIMNÁNTHES. (Greek: *marsh flower;* but in fact the plant flourishes in merely moist soil.) ①

L. Douglàsii, R. Br. Low and spreading, mostly smooth, and slightly succulent; leaves divided into 5–7 oblong or lanceolate and often 3–5-cleft leaflets; flowers (in summer) solitary on slender axillary peduncles; petals white with a yellow base, wedge-oblong, notched at the end, twice the length of the calyx, about ½′ long. Cult. from California.

4. **FLŒRKEA**, FALSE MERMAID. (For *Flœrke*, a German botanist.) ①

F. proserpinacoìdes, Willd. A small and insignificant plant; leaf segments 3–5, lanceolate and entire, or rarely 2–3-cleft; the axillary and peduncled flower inconspicuous (in spring and summer), the oblong petals shorter than the calyx and entire. Marshes and river banks, N. and W.

5. **ÓXALIS**, WOOD SORREL. (Greek: *sour*, from the acid juice.) An attractive genus of small herbs, with many cultivated species.

* *Peduncles 1-flowered; petals white, red, or variegated.*

O. Acetosélla, Linn. TRUE W. The leafstalks and 1-flowered scapes 2′–4′ high from a creeping, scaly-toothed rootstock; flower rather large, white, with delicate reddish veins. Common in mossy woods N. 2

O. variábilis, Jacq. Is more hairy; leaflets obovate and scarcely notched, commonly crimson beneath, only 1′ long; scapes short, 3′; petals 1½′ long, white, or pink-red with a yellowish base. Cape of Good Hope.

O. versícolor, Linn. From small bulbs, sends up slender stems, 2′–3′ high; leaflets almost linear, notched at the end; petals 1′ long, white or tinged with rose, with bright, pink-red margins outside, so that the blossom is red when rolled up in the bud or closed in shade, but white above when it opens in sunshine. Cape of Good Hope.

O. flàva, Linn. From a strong bulb, sends up to the surface a short scaly stem, bearing thick flattish leafstalks and short scapes; the leaflets 6–10 and linear; petals nearly 1′ long, yellow, often edged with reddish. Cape of Good Hope.

* * *Peduncles 2–∞-flowered.*

+– *Leaflets 4 or 7–10; flowers crimson to purplish; stemless, hairy.* 2

O. tetraphýlla, Cav. Leaflets 4, obcordate, with a brownish blotch or band when young. Mexico. O. DÉPPEI of gardens.

O. lasiándra, Graham. Leaflets 7–10, oblanceolate, 3′ long by 1′ broad, obtuse and entire at apex; scapes 9′–18′ high, with a many-flowered umbel. Mexico.

+– +– *Leaflets 3.*

++ *Flowers yellow.*

O. corniculàta, Linn. YELLOW W., LADIES' SORREL. 1° high, pubescent, with sharp, oppressed hairs; stipules round or truncate, ciliate; peduncles 2–6-flowered; pods long, erect. Rare eastward, indigenous Mo. and S.W.; but

Var. **stricta**, Sav., is extremely common; stems erect, nearly smooth to very villous; leafy; stipules 0.

Var. RÙBRA is a purple-leaved form in cultivation.

O. recúrva, Ell. Like the first variety of the preceding; leaflets larger (½′–1½′ broad), usually with a brownish margin; flowers larger (6″–8″ long). Penn. to S. Ill. and S.

O. Ortgièsi, Regel. Stems purplish-red, erect, 1° high, rather fleshy, becoming tough or woody below; leaflets obovate, with 2-pointed lobes, the notch broad, olive-green above, purple beneath; flowers small, in cymes on long axillary peduncles. Peru.

O. Valdiviénsis, Barn. Stem smooth, 1° high, branching at base; leaflets obcordate, the lobes very round; petals deep yellow, with reddish veins, especially outside. Chile.

++ ++ *Flowers violet, purple, or rose-red.*

O. violàcea, Linn. VIOLET W. Leafstalks and slender scape from a scaly bulb, the flowers several in an umbel, middle-sized, violet. 2 Common S., rarer N., in rocky or sandy soil. In common cultivation.

O. Bowieàna, Lodd. Whole plant finely pubescent; leafstalks and few-flowered scapes 6′–10′ high from a small bulb on a spindle-shaped root; broad obcordate leaflets almost 2′ long; petals deep rose-color, 1′ long. Cape of Good Hope.

6. **PELARGÒNIUM**, the GERANIUM, so-called, of house and summer-garden culture. (Greek: *stork*, from the beak of the fruit, which is like that of Geranium.) 2ℓ Natives of the Cape of Good Hope; in cultivation so much modified that it is often difficult to distinguish the original species. A synopsis of the chief groups is given.

I. Ivy Geraniums. *Stems trailing; leaves peltate and fleshy, the 5 lobes entire, generally smooth, with or without a darker zone. Now crossed with the next for the sake of the larger flowers.*

P. peltàtum, Ait. Ivy-leaved P. Generally smooth, the leaf fixed towards the middle, with or without a darkish zone; flowers pink or varying to white.

II. Scarlet, Horseshoe, Fish, Bedding or Zonal Geraniums. *Stems erect, obscurely lobed with large scallops or irregularly cut; leaves round and crenate, and with a deep narrow sinus, often with a horseshoe-shaped dark zone, many forms* (Tricolors) *with bronzy-golden or silver-edged or variegated leaves; petals all of one color or variegated (scarlet, pink, or varying to white); stems erect, shrubby, and succulent.*

P. zonàle, Willd. Horseshoe P. So called from the dark horseshoe mark or zone on the leaves, which, however, is not always present; petals smoothish, narrowish.

P. inquinans, Ait. Staining or Scarlet P. In the unmixed state is soft-downy and clammy, the leaves without the zone; petals broadly obovate, originally intense scarlet.

III. Lady Washington Geraniums; Pelargoniums; Decorative, Show or Fancy P. *of gardeners. Leaves usually moderately lobed, but sometimes rather deeply cut, mostly sharply toothed; flowers very large (2′ or more), usually decidedly irregular, the 2 upper petals larger and streaked or spotted; stem decidedly shrubby.*

* *Leaves more or less hairy or pubescent.*

P. cucullàtum, Ait. Cowled P. Soft-hairy, the rounded kidney-shaped leaves cupped, soft-downy.

P. cordàtum, Ait. Heart-leaved P. Like the last or less hairy, with flat, ovate-heart-shaped leaves.

P. angulòsum, Ait. Maple-leaved P. Harsher-hairy; the leaves rigid, inclined to be lobed, truncate or even wedge-shaped at the base (scarcely ever heart-shaped), sharply toothed.

* * *Leaves smooth and pale or glaucous, rounded, palmately 5–7-cleft.*

P. grandiflòrum, Willd. Great-flowered P. Shrubby; peduncles bearing about 3 large flowers, with white petals 1½′ long, the two upper larger and elegantly veined or variegated with pink or rose-color.

IV. Rose Geraniums. *Leaves hairy, roundish, often rough, lobed or deeply pinnatifid (rarely only crenate), or in the last one palmately 3-parted, balsamic or strong-scented; plants cult. chiefly for the fragrant foliage; the small rather sparse flowers rose-colored or purple, petals often darker-veined.*

* *Velvety or soft-hairy; leaves moderately or not at all lobed.*

P. capitàtum, Ait. Rose-scented P. Softly hairy, with the rose-scented leaves moderately lobed, the lobes short and broad; peduncle

bearing many sessile flowers in a head; petals rose-purple, barely ½′ long.

P. tomentòsum, Jacq. PEPPERMINT P. Densely soft-hairy; branches long and thickish; leaves rather large, round-heart-shaped and with 5–7 open lobes, velvety-hairy both sides; flowers on long pedicels in panicled umbels, insignificant; petals white, the 3 lower a little longer than the calyx.

P. odoratìssimum, Ait. NUTMEG-SCENTED P. Branches slender and straggling, from a very short, scaly stem or base; leaves rounded and crenate, soft-velvety, small; flowers on short pedicels, very small; petals white, scarcely exceeding the calyx.

* * *Hairy, roughish, or occasionally downy; leaves more or less pinnatifid or pinnately compound or the main lobes or divisions pinnatifid.*

P. quercifòlium, Ait. OAK-LEAVED P. Shrubby, hairy, and glandular; leaves deeply sinuate-pinnatifid, with wavy-toothed blunt lobes (the lowest ones largest, making a triangular-heart-shaped outline), often dark-colored along the middle, unpleasantly scented; petals purple or pink, the two upper (1′ long) much longest.

P. gravèolens, Ait. HEAVY-SCENTED P. Shrubby and hairy like the last; leaves palmately 5–7-lobed or parted, and the oblong lobes sinuate-pinnatifid; petals shorter.

P. râdula, Ait. ROUGH P. Shrubby, rough and hairy above with short bristles; the balsamic or mint-scented leaves palmately parted and the divisions pinnately parted or again cut into narrow linear lobes, with revolute margins; peduncles short, bearing few small flowers; petals rose-color, striped or veined with pink or purple.

P. fúlgidum, Ait. BRILLIANT P. Shrubby and succulent-stemmed, downy; leaves mostly 3-parted, with the lateral divisions wedge-shaped and 3-lobed, the middle one oblong and cut-pinnatifid; calyx broad in the throat; petals obovate, scarlet, often with dark lines, ½′ long.

P. trìste, Ait. SAD OR NIGHT-SCENTED P. Stem succulent and very short from a tuberous rootstock, or none; leaves pinnately decompound, hairy; petals dull brownish-yellow with darker spots, sweet-scented at night.

P. exstipulàtum, Ait. PENNYROYAL P. Low, rather shrubby; leaves (with no stipules) with the sweet scent of Pennyroyal or Bergamot, ½′ wide, the 3 palmate lobes wedge-shaped and cut-toothed; flowers small and insignificant, white.

7. TROPÆ̀OLUM, NASTURTIUM or INDIAN CRESS. (Greek: *a trophy*, the foliage of the common sort likened to a group of shields.) Cult. from South America, chiefly Peru, for ornament, and the pickled fruits used as a substitute for capers, having a similar flavor and pungency; flowers all summer, showy. ①

* *Leaves obscurely, if at all, lobed.*

T. màjus, Linn. COMMON N. Climbing high, also low and scarcely climbing variety; leaves roundish and about 6-angled, peltate towards the middle; spur straight, attenuate, petals much longer than calyx, all shades of yellow and red, from cream-white to nearly black, pointless, entire or a little jagged at the end, and the 3 lower and longer-clawed ones fringed at the base; also a full double variety.

T. mìnus, Linn. SMALLER N. Smaller; petals with a bristle-like point. Much less common than the preceding, but mixed with it.

T. Lobbiànum, Veitch. Pilose all over except the petals and upper side of the leaves; leaves obscurely lobed, the lobes mucronulate; spur straight, thickish, three lower petals long-clawed, deeply toothed, fringed at base; shades of red chiefly, to nearly black. Colombia.

* * *Leaves 5–7-lobed or parted.*

T. peregrìnum, Willd. CANARY BIRD FLOWER. Climbing high; lobes of the leaves mucronate and cut; spur hooked or curved; petals light yellow, the 2 upper cut into slender lobes, the 3 lower small and fringed.

8. IMPÀTIENS, TOUCH-ME-NOT, JEWELWEED, BALSAM. (Name from the sudden bursting of the pod when touched.)

* *Native, in low places.* ①

I. pállida, Nutt. PALE T. 1°–4° high, branched; leaves alternate, oval; flowers panicled, pale yellow dotted with brownish-red (rarely spotless), the sac broader than long and tipped with a short, incurved spur. Wet ground and moist shady places, commonest N.

I. fúlva, Nutt. SPOTTED T. Has smaller orange-colored flowers spotted with reddish-brown, sac longer than broad and tapering into a strongly inflexed spur (spots and spur rarely wanting). Common, especially S.

* * *Garden species.*

I. Balsámina, Linn. GARDEN BALSAM, from India. Low, with crowded lanceolate leaves, the lower opposite, a cluster of large and showy short-spurred flowers in their axils, on short stalks, of very various shades (from white to red and purple); the finer sorts full double. ①

I. Sultáni, Hook. Erect, leaves acuminate at both ends, serrate with a bristle at each tooth; flowers solitary or 2–3 together, on slender axillary peduncles; petals scarlet, quite flat, the lateral ones cleft to the base, the lobes somewhat larger than the third; blade of spurred sepal not half the length of petals, spur long, slender, up-curved. Zanzibar. Cult. in greenhouses. ♃

XXVI. RUTACEÆ, RUE FAMILY.

Known by the transparent dots or glands resembling punctures (wanting in No. 4) in the simple or compound leaves, containing a pungent or acrid bitter-aromatic volatile oil; and stamens only as many or twice as many as the sepals (or in Orange and Lemon more numerous), inserted on the base of a receptacle (or a glandular disk surrounding it) which sometimes elevates more or less the single compound pistil or the 2–5 more or less separate carpels. Leaves either opposite or alternate, in ours mostly alternate, without stipules. Flowers only in No. 2 irregular. Many species are medicinal.

§ 1. *Perennial, strong-scented, hardy (exotic) herbs; flowers perfect; stamens* 8 *or* 10; *ovary* 4–5-*lobed*, 4–5-*celled; seeds several.*

1. RUTA. Sepals and petals 4 or 5, short, the latter roundish and arching. Stamens twice as many as the petals. Style 1. Pod globular and many-seeded. Leaves decompound.
2. DICTAMNUS. Sepals and petals 5; the latter long and lanceolate, on short claws, the lower one declining, the others ascending. Stamens 10; the long filaments declining and curved, partly glandular. Styles 5, nearly separate. Ovary a little elevated, deeply 5-lobed, in fruit becoming 5 flattened, rough-glandular, 2–3-seeded pods, each splitting when ripe into 2 valves, which divide into an outer and an inner layer. Leaves pinnate.

§ 2. *Shrubs or trees, hardy, with polygamous, diœcious, or sometimes perfect, small (greenish or whitish) flowers; stamens 4–6, as many as the petals; seeds single or in pairs.*

* *Leaves compound, deciduous.*

3. XANTHOXYLUM. Flowers diœcious. Pistils 2–5; their styles slightly cohering; the ovaries separate, ripening into rather fleshy at length dry and 2-valved little pods. Seed black, smooth, and shining. Prickly trees or shrubs; leaves pinnate; these and the bark and pods very pungent and aromatic.

4. PHELLODENDRON. Flowers diœcious, greenish, inconspicuous; stamens 5–6; ovary 5-lobed, rudimentary. Drupes berry-like, black, the size of a pea, with 5 stones, in flat corymbs, hanging all winter. Leaves opposite, leaflets oblong-lanceolate, long-acuminate, serrulate, not pellucid-punctate.

5. PTELEA. Flowers polygamous. Pistil a 2-celled ovary tipped with a short style, forming a 2-celled, 2-seeded, and rounded wing-fruit or samara, in shape like that of the Elm. Not prickly; leaflets 3.

* * *Leaves simple and entire, evergreen.*

6. SKIMMIA. Flowers polygamous or perfect. Ovary 2–5-celled, with a single ovule from the top of each cell, in fruit becoming a red berry or drupe.

§ 3. *Shrubs or trees, exotic (only one hardy), with sweet-scented foliage and conspicuous, white, fragrant and perfect flowers.*

7. CITRUS. Petals 4–8, usually 5, thickish. Filaments irregularly united more or less. Ovary many-celled, encircled at the base by a conspicuous disk (Lessons, p. 113, Fig. 363), in fruit becoming a many-seeded, large berry with a thick rind. Branches usually spiny. Leaves evergreen, compound or apparently simple, but with a joint between the blade and the (commonly winged or margined) petiole, showing that the leaf is a compound one reduced to the end-leaflet. Flowers white, very fragrant, rather showy.

8. ÆGLE. Stamens fewer, and all distinct and free. Parts of the flower in 3's or 5's. Leaves trifoliate.

1. RÙTA, RUE. (The ancient name.) Natives of the Old World.

R. graveòlens, Linn. Common Rue. A bushy herb, woody or almost shrubby at the base; leaflets small, bluish-green and strongly dotted, oblong or obovate, the terminal one broader and notched at the end, corymbs of greenish-yellow flowers produced all summer; the earliest blossom has the parts in 5's, the rest in 4's. Plant very acrid, sometimes even blistering the skin. Cult. in country gardens.

2. DICTÁMNUS, FRAXINELLA, GAS PLANT. (Ancient Greek name.)

D. álbus, Linn. (or D. Fraxinélla.) Herb with an almost woody base, viscid-glandular, and with a strong aromatic scent; the leaves likened to those of Ash on a smaller scale (whence one of the common names) of 9–13 ovate and serrate leaflets; the large flowers in a terminal raceme, in summer, in one variety pale purple with redder veins, another white. S. Eu.

3. XANTHÓXYLUM, PRICKLY ASH. (Greek: *yellow wood.*)

X. Americànum, Mill. Northern P., or Toothache Tree. Leaves downy when young, of 9–11 ovate or oblong leaflets; the greenish flowers in axillary clusters, in spring, preceding the leaves, the sepals wanting; pistils 3–5 with slender styles; pods about the size and shape of pepper-corns, lemon-scented, raised from the receptacle on thickish stalks. Rocky woods and banks, N.

X. Clàva-Hérculis, Linn. Southern P. A small tree, the bark with warty and the leafstalks with very slender prickles, smooth, with 7–9 ovate or lance-ovate leaflets, and whitish flowers in a terminal cyme, in

early summer, later than the leaves, petals and sepals both present, 3 or 2 short-styled pistils; pods not stalked. Sandy coast S.

4. PHELLODÉNDRON, CORK TREE. (Greek: *cork tree.*)

P. Amurénse, Rupr. A spreading, hardy tree with ash-gray, deeply furrowed corky bark, the inner bark lemon-yellow; leaflets 2–6 pairs; general aspect of Ailanthus. Amur region.

5. PTÈLEA, HOP TREE. (The ancient Greek name for the Elm, from the resemblance in the winged fruit.)

P. trifoliàta, Linn. THREE-LEAVED H. A tall shrub, with ovate pointed leaflets, and a terminal cyme of small, greenish-white, unpleasantly scented flowers, in early summer; the orbicular winged fruit bitter. Rocky woods from L. I. to Minn. and S. Also planted, as vars., with variegated or yellow leaves.

6. SKÍMMIA. (Japanese: *skimmi*, the local name of the first-known species.) Not fully hardy in the Northern States.

S. Fortùnei, Masters. (S. JAPÓNICA of gardens.) A low, quite hardy shrub, smooth, with oblong and entire, dark green, evergreen leaves, crowded on the end of the branches, which in spring are terminated with a close panicle or cluster of small and white sweet-scented, perfect flowers, of no beauty, but followed by dull crimson, obovoid berries which last over winter. China.

S. Japónica, Thunb. (S. OBLÀTA and S. FRÀGRANS of gardens). Taller; flowers polygamous; leaves pale yellowish-green; berries bright red, truncate or depressed, but rarely produced. Japan.

7. CÍTRUS, CITRON, ORANGE, LEMON, etc. (Ancient name for *citron.*) Small trees, native to eastern Asia, grown in conservatories in the north for ornament, and in Florida and California extensively planted for fruit. (Lessons, Fig. 363.)

* LEMONS, ETC. *Glabrous. Flowers (and young shoots) usually tinged with red; fruit mostly elongated and rough, with a nipple or projection at the tip, the rind closely adherent to the flesh, which is usually acid.*

C. Mèdica, Linn. CITRON. Leaves oblong or oval, acute, the petiole short, winged or not; fruit large, the rind very aromatic and covered with humps; the juice not abundant nor very acid. Named for the country Media.

Var. ***Limon***, Linn. LEMON. Petiole narrowly winged; fruit distinctly elongated, the rind not lumpy, with an abundant and acid juice.

Var. ***àcris***, Martyn. SOUR LIME. Flowers smaller; fruit small, variable in shape, the juice very acid.

* * ORANGES. *Glabrous. Flowers white; fruit mostly roundish, without a nipple, the skin much thinner and smoother, and separating from the flesh, which is usually sweetish.*

C. Aurántium, Linn. ORANGE. Tree, with ovate, large leaves, and petiole either winged or naked; fruit globose, usually 3′–4′ in diameter, golden-yellow, with a sweet edible flesh. China.

Var. ***vulgàris***, Wight & Arn. BITTER OR SEVILLE ORANGE. Petiole usually broadly winged; fruit small, with a thin roughish rind and bitter pulp. Run wild in Florida and other parts of the world; a deteriorated form of the Orange.

C. nòbilis, Lour. MANDARIN, TANGERINE, KID-GLOVE ORANGE, OONSHIU. Tree small or bushy and much spreading; leaves smaller and narrower, the petioles not winged; fruit small, flattened, the very thin golden-russet rind parting readily from the loosely cohering, dryish, and sweet carpels. Hardier than the Orange. Japan and China.

* * * SHADDOCK. *Young growth pubescent. Flowers white; fruit very large, often borne in clusters, roundish, with a smooth rind and no nipple; the flesh acid and very juicy.*

C. Decumàna, Lour. SHADDOCK, POMELO, GRAPE FRUIT. Leaves very large and broad, often emarginate, pubescent beneath; petioles much winged; fruit pale with distinct bitterish acid vesicles. Polynesia.

8. ÆGLE. (Name of one of the Hesperides.)

Æ. sepiària, DC. (or CITRUS TRIFOLIÀTA). A shrub with strong thorns, 3 elliptic-crenulate leaflets, solitary flowers in the axils of the thorns, and a light yellow, many-seeded, austere fruit, 1′ in diameter. Hardy in protected places as far N. as Washington. Grown for ornament, hedges, and as a stock upon which to dwarf oranges. Japan.

XXVII. SIMARUBACEÆ, QUASSIA FAMILY.

May be regarded as Rutaceæ without transparent dots in the leaves. (Phellodendron may be sought here. See the last family.) Here represented by a single tree, the

1. AILÁNTHUS, CHINESE SUMACH or TREE OF HEAVEN. (*Ailanto,* a native name.) Flowers polygamous, small, greenish, in terminal branched panicles, with 5 short sepals and 5 petals, 10 stamens in the sterile flowers, and few or none in the fertile flowers; the latter with 2–5 ovaries (their styles lateral, united, or soon separate), which in fruit become linear-oblong, thin, and membranaceous, veiny samaras or keys, 1-seeded in the middle.

A. glandulòsus, Desf., the only species known here, from China, is a common shade tree, tall, of rapid growth, with hard wood, very long pinnate leaves, and many obliquely lanceolate, entire, or sparingly sinuate leaflets; flowers in early summer, the staminate ill-scented.

XXVIII. MELIACEÆ, MELIA FAMILY.

Trees, chiefly with pinnately compound dotless leaves, stamens twice as many as the petals and united up to or beyond the anthers into a tube, and a several-celled ovary with a single style; almost all tropical.

1. MÈLIA. (Old Greek name of the Ash, transferred to a widely different tree.) Calyx 5–6-parted; petals 5 or 6, linear-spatulate; filaments united into a cylindrical tube with a 10–12-cleft mouth, inclosing as many anthers; fruit a globose berry-like drupe, with a bony 5-celled stone, and a single seed in each cell. Flowers in large compound panicles.

M. Azédarach, Linn. PRIDE OF INDIA or CHINA TREE. A favorite shade tree at the S., 30°–40° high; leaves twice pinnate, smooth; leaflets ovate and pointed-toothed, of a deep green color; flowers numerous, fragrant, lilac-colored in spring, succeeded by the yellowish fruit.

XXIX. ILICINEÆ, HOLLY FAMILY.

Trees or shrubs, with leaves alternate, simple; stipules small, usually falling early; small, mostly polygamous, or dioecious, axillary flowers, having divisions of the free calyx, petals (these almost or quite distinct), stamens (alternate with petals), and cells of the ovary of the same number (4–8 or even 9), and fruit berry-like, containing 4–8 single-seeded little stones. Ovule solitary, hanging from the top of each cell. Sessile stigmas 4–8, or united into one. Flowers white.

1. ILEX. Parts of the flower 4–6. Petals or corolla-lobes oval or obovate. Sterile flowers clustered in the axils; fertile, often solitary. Flowers early summer; fruit autumn.
2. NEMOPANTHES. Parts of the flower 4 or 5. Petals linear. Calyx-teeth minute or obsolete. Flowers solitary on long, slender, axillary peduncles.

1. ÌLEX, HOLLY. (Ancient Latin name of the Holly Oak.)

§ 1. True Holly, *with thick and rigid evergreen leaves, red berries, and parts of the flowers in fours, rarely some in fives or sixes.*

* *Leaves spiny-toothed.*

I. Aquifòlium, Linn. European Holly, is occasionally planted, but not hardy N.; tree with very glossy and wavy, spiny leaves; umbellate clusters of many flowers followed by many varieties in form and variegation of leaves and color of berries, in cultivation. Bright red berries.

I. opàca, Ait. American H. Tree 20°–40° high, smooth, with gray bark, oval leaves, wavy-margined and spiny-toothed; flowers one to few in a cluster, berries dull red. Low grounds from Maine and Ind. S. Also cult.

* * *Leaves not spiny.*

I. Cassìne, Linn. Cassena, Yaupon. Shrub on the sandy coast S., with oblong or lance-ovate, crenate leaves only 1′ long, and flowers in sessile clusters. Leaves used for *Yaupon tea.*

I. Dahòon, Walt. Dahoon H. Shrub or small tree, of low pine barrens from E. Va. S., a little downy, with obovate or oblong-linear, short-petioled leaves sparingly toothed above the middle; or, var. **myrtifòlia**, with narrower leaves barely 1′ long and mostly entire.

§ 2. Prinoides. *Parts of the flower* 4, 5, *rarely* 6; *nutlets striate on the back; shrubs with deciduous, mostly thin leaves; drupes red or purple.*

I. decídua, Walt. Leaves wedge-oblong or lance-obovate, obtusely serrate, downy on the midrib beneath, when old, glossy above; calyx-lobes acute. Wet grounds S. and W.

I. montícola, Gray. Leaves ovate or lance-oblong, 3′–5′ long, acuminate, thin, smooth, sharply serrate; fertile peduncles very short. N. Y., S. in the mountains.

I. móllis, Gray. Like the last, but leaves, softy-downy beneath; pedicels and calyx downy. Shady grounds along the Alleghanies from Penn. S.

§ 3. Prinos. *Parts of the blossom* 6 (*or sometimes* 5–9) *in the fertile*, 4–6 *in the sterile flowers; nutlets of the berry smooth and even; shrubs.*

* *Leaves deciduous; flower-clusters sessile* (*or fertile flowers solitary*); *fruit bright red.*

I. verticillàta, Gray. Common Winter Berry, Black Alder. Leaves (1½′–2′ long) obovate or wedge-lanceolate serrate, acute or pointed at

both ends, downy on the veins beneath; flowers very short-peduncled, mostly clustered, very bright scarlet-red berries ripening late in autumn. There is nothing whorled in the leaves or flowers, so that the name is rather misleading. Common in low grounds.

I. lævigàta, Gray. Smooth W. Leaves mostly smooth, lanceolate or oblong-lanceolate, minutely serrate, glossy above, long-peduncled sterile flowers, and larger, less bright berries ripening earlier. Wet grounds Me. to Va.

* * *Leaves thickish, evergreen, glossy above, often blackish-dotted beneath; fruit black.*

I. glàbra, Gray. Ink Berry. 2°–4° high; leaves wedge-oblong, few-toothed near the apex; flowers several on the sterile, solitary on the fertile peduncles. Along sandy coasts from Mass. S.

2. NEMOPÁNTHES. (Greek: *flower stalk, a thread.*)

N. fasciculàris, Raf. Mountain Holly. A much-branched shrub; leaves alternate, oblong, deciduous, nearly or quite entire, smooth. Cold damp woods Me. to Va. and Ind. N. W.

XXX. CELASTRACEÆ, STAFF TREE FAMILY.

Shrubs, sometimes twining, with simple leaves, minute and deciduous stipules or none, and small flowers with sepals and petals both imbricated in the bud, and stamens of the number of the latter, alternate with them, and inserted on a disk which fills the bottom of the calyx and often covers the 2–5-celled, few-ovuled ovary; the seeds usually furnished with or inclosed in a fleshy or pulpy aril.

1. CELASTRUS. Flowers polygamous or diœcious. Petals and stamens 5, on the edge of a concave disk which lines the bottom of the calyx. Filaments and style rather slender. Pod globular, berry-like, but dry, orange; aril scarlet. Leaves alternate; a woody twiner.
2. EUONYMUS. Flowers perfect, flat; the calyx-lobes and petals (4 or 5) widely spreading. Stamens mostly with short filaments or almost sessile anthers, borne on the surface of a flat disk which more or less conceals or covers the ovary. Pod 3–5-lobed, generally bright-colored. Leaves opposite; branchlets 4-sided. Shrubs not twining, with dull-colored inconspicuous flowers, in small cymes on axillary peduncles, produced in early summer; the pods in autumn ornamental, especially when they open and display the seeds enveloped in their scarlet, pulpy aril.

1. CELÁSTRUS, STAFF TREE. (Old Greek name for some evergreen, which this plant is not.)

C. scándens, Linn. Climbing Bittersweet; Waxwork. Smooth, with thin ovate-oblong and pointed, finely serrate leaves, racemes of greenish white flowers (in early summer) terminating the branches, the petals serrate or crenate toothed, wild in low grounds, and planted for the showy, autumnal fruit.

C. articulàtus, Thunb., a Japanese species, with conspicuously warty branches, obovate or oval crenate leaves, and short peduncled axillary flowers, is hardy, and occasionally planted, but inferior to the native species. The fruit hangs long after the leaves have fallen.

2. **EUÓNYMUS**, SPINDLE TREE, BURNING BUSH, STRAWBERRY TREE. (Greek: *of good repute.*)

* *Leaves deciduous, ovate.*

+– *Branches not winged.*

++ *Native species; anthers nearly or quite sessile.*

E. atropurpùreus, Jacq. BURNING BUSH OR SPINDLE TREE. Tall shrub, wild from New York W. and S., and commonly planted; with short, small buds and oval or oblong, petioled, sharply serrate leaves; flowers with rounded, dark, dull-purple petals (generally 4), and smooth, deeply 4-lobed, red fruit, hanging on slender peduncles.

E. Americànus, Linn. AMERICAN STRAWBERRY BUSH. Low shrub, wild from New York W. and S., and sometimes cult.; with thickish ovate or lance-ovate, almost sessile leaves, usually 5 greenish-purple rounded petals, and rough-warty, somewhat 3-lobed fruit, crimson when ripe. Var. **obovàtus**, with thinner and dull obovate or oblong leaves, has long and spreading or trailing and rooting branches.

++ ++ *Exotic; anthers raised on evident filaments.*

E. Europæus, Linn. EUROPEAN SPINDLE TREE. Occasionally planted, but inferior to the foregoing; a rather low shrub, with lance-ovate or oblong, short-petioled leaves, about 3-flowered peduncles, 4 greenish oblong petals, and a smooth, 4-lobed red fruit, the aril orange-color. Eu.

E. latifòlius, Bauh. Has long, pointed, large buds, many-flowered peduncles, whitish flowers and red-ariled fruit. Eu.

+– +– *Branches strongly winged.*

E. Thunbergiànus, Blume. (In cult. as E. ALÀTUS.) Smooth branches with 4 corky wings (these rarely wanting); leaves elliptic, acuminate; peduncles 1–3-flowered, capillary; capsule 4-parted, smooth. Japan.

* * *Leaves deciduous or nearly so; linear.*

E. nànus, Bieb. 2°–3° high; leaves coriaceous, linear (1′–2′ long), on the young shoots alternate or apparently whorled, margin revolute; pod pink; aril orange, covering only half the seed. Caucasus. Hardy N.

* * * *Leaves evergreen, ovate or oblong.*

E. Japónicus, Thunb. JAPAN S. Planted S. under the name of CHINESE BOX, there hardy, but tender N.; leaves obovate, shining and bright green, also forms with white or yellowish variegation; peduncles several-flowered; petals 4, obovate, whitish; pods smooth, globular.

Var. ***radìcans***, climbing by rootlets, leaves varying from oval and very short-petiolate to ovate or elliptic and distinctly petiolate. Hardy N. to Mass.

XXXI. RHAMNACEÆ, BUCKTHORN FAMILY.

Shrubs or trees, of bitterish and astringent properties, with simple, chiefly alternate leaves, and small flowers; well marked by the stamens of the number of the valvate sepals (4 or 5) and alternate with them, i.e. opposite the petals, inserted on a disk which lines the calyx-tube and often unites it with the base of the ovary, this having a single, erect ovule in each of the (2–5) cells. Branches often thorny; stipules minute or none; flowers often apetalous or polygamous. Petal commonly hooded or involute around the stamen before it. (Lessons, Figs. 364, 365.)

* *Calyx free from the ovary.*

1. BERCHEMIA. Twining climbers, with alternate, straight-veined leaves. Petals 5, without claws, rather longer than the stamens. Disk thick, nearly filling the bottom of the calyx. Ovary 2-celled, becoming a 2-celled, small stone-fruit.
2. SAGERETIA. Trailing shrubs, with opposite, persistent leaves. Petals 5, minute. Ovary 3-celled, becoming a 3-seeded stone-fruit.
3. RHAMNUS. Erect shrubs or trees. Petals 4 or 5 or 0, notched, with short claws. Stamens short. Ovary 2–4-celled, becoming a black, berry-like fruit, containing 2–4 cartilaginous seed-like nutlets. Flowers greenish, axillary, mostly in small clusters, in early summer. Berry-like fruit mawkish.

* * *Calyx with the disk coherent with the base of the ovary and fruit.*

4. CEANOTHUS. Erect or depressed shrubs or undershrubs. Petals 5, hood-shaped, spreading, their claws and the filaments slender. Ovary 3-celled, when ripe becoming a cartilaginous or crustaceous 3-seeded pod. Flowers in little umbels or fascicles, usually clustered in dense bunches or panicles, handsome, the calyx and even the pedicels colored like the petals and stamens. Ours are low undershrubs, with white flowers.

1. BERCHÈMIA, SUPPLE-JACK. (Probably named for some person.)

B. volùbilis, DC. Climbing on high trees, smooth, with very tough and lithe stems (whence the popular name); leaves small, oblong-ovate and simply parallel-veined; flowers greenish white, in small panicles terminating the branchlets, in early summer; drupe purple. Common in low grounds S.

2. SAGERÈTIA. (Named for *Sageret*, an able French agriculturist.)

S. Michaùxii, Brongn. Stems vine-like and many feet long, trailing in the sands along the coast from N. C., South; leaves an inch long and nearly sessile, finely serrate, shining; spikes of flowers slender and interrupted, clustered; drupe dark purple.

3. RHÁMNUS. BUCKTHORN. (The ancient name.)

* *Flowers usually diœcious; nutlets and seeds deeply grooved on the back; winter buds scaly.*

+ *Flowers with petals, the parts in fours; leaves minutely serrate.*

R. cathártica, Linn. COMMON BUCKTHORN. Cult. from Eu., for hedges, run wild in a few places; forms a small tree, with thorny branchlets, ovate or oblong leaves, and 3–4-seeded fruit.

R. lanceolàta, Pursh. NARROW-LEAVED B. Wild from Penn. S. and W.; shrub not thorny, with lanceolate or oblong leaves and 2-seeded fruit.

+ + *Flowers without petals; stamens and lobes of the calyx* 5.

R. alnifòlia, L'Her. ALDER-LEAVED B. Wild in cold swamps N.; a low shrub, with oval, acute, serrate leaves, and 3-seeded, berry-like fruit.

* * *Flowers perfect; nutlets and seeds not furrowed; winter buds naked.*

R. Caroliniàna, Walt. INDIAN CHERRY. A thornless shrub or low tree, with oblong and almost entire, rather large leaves; flowers solitary or in small clusters in the axils, in early summer on peduncles shorter than the petioles; the 3-seeded fruit at first crimson, finally black. Wild in wet grounds, from N. J. and Ky. S.

R. Purshiàna, DC. From the N. W. coast, with peduncles much longer than the petioles of the serrulate leaves, and ***R. Frángula***, Linn., from Eu., with the flower clusters sessile and leaves entire, are occasionally planted.

4. **CEANOTHUS**. (An ancient name of unknown meaning.)

C. Americànus, Linn. New Jersey Tea or Redroot. 1°–2° high, from a dark red root; leaves ovate or oblong-ovate, finely serrate, downy beneath, 3-ribbed and veiny, deciduous (once used as a substitute for tea); flowers crowded in a dense, slender-peduncled cluster, in summer. Wild in dry grounds.

C. ovàtus, Desf. Lower than the preceding and nearly smooth; leaves smaller, narrow-oval, or lance-oblong; flowers on a short peduncle in spring. Wild on rocks N., from Vermont to Minn., rare E.

C. microphýllus, Michx. Small-leaved C. Low and spreading, much branched; leaves evergreen, very small, obovate, 3 ribbed; flower-clusters small and simple in spring. Dry barrens S.

XXXII. VITACEÆ, VINE FAMILY.

Woody plants, climbing by tendrils, with watery and often acid juice, alternate leaves, deciduous stipules, and small greenish flowers in a cyme or thyrsus; with a minutely 4–5-toothed or almost obsolete calyx; petals valvate in the bud and very deciduous; the stamens as many as the petals and opposite them; a 2-celled ovary with a pair of ovules rising from the base of each cell, becoming a berry containing 1–4 bony seeds. Tendrils and flower-clusters opposite the leaves.

* *Climbing by naked-tipped tendrils; ovary surrounded by a nectar secreting disk.*

1. VITIS. Petals and stamens 5, the former lightly cohering at the top and thrown off without expanding; the base of the very short and truncate calyx filled with the disk, which rises into 5 thick lobes or glands between the stamens; leaves simple, rounded, and heart-shaped, usually 3–5-lobed. Fruit a pulpy berry.

2. CISSUS. Flowers in an ovate panicle. Petals and stamens 4 or 5, the former opening regularly; disk thick and broad, 4–5-lobed; flowers mostly perfect; berries not larger than peas, not edible. Tendrils in ours among the flowers, which are panicled or cymose.

* * *Climbing by the adhesion of the dilated tips of tendrils* (Lessons, p. 41, Figs. 93, 94); *disk* 0.

3. AMPELOPSIS. Corolla expanding. Petals thick. Flowers cymose.

1. VÌTIS, GRAPEVINE. (Classical Latin name.) Flowers in late spring.

§ 1. *Bark loose, shreddy; tendrils forked; nodes solid.*

* *A tendril (or inflorescence) opposite every leaf.*

V. Labrúsca, Linn. Northern Fox Grape, etc., furnishing most of the American table and wine grapes; leaves and young shoots very cottony, even the adult leaves retaining the cottony wool underneath, the lobes separated by roundish sinuses; fruit large, with a tough musky pulp when wild, dark purple, or amber-color in compact clusters. Common in moist grounds N. and E. The original of the Concord, Hartford, and many others.

* * *Tendrils intermittent (none opposite each third leaf).*

+ *Leaves pubescent and floccose, especially beneath when young.*

V. æstivàlis, Michx. Summer Grape. Branches terete; leaves green above, and with loose, cobwebby, rusty down underneath, the lobes

with roundish open sinuses; clusters slender; fruit smaller and earlier than in the foregoing, black with a bloom, pleasant. Common from Va., S. Original of the HERBEMONT, NORTON'S VIRGINIA, and others.

V. bícolor, Le Conte, represents the last in the N., has very glaucous wood, thin leaves, glaucous-blue and only thinly pubescent below, and late, austere, very small fruits.

V. cinèrea, Engelm. DOWNY GRAPE. Branches angular, pubescence grayish or whitish and persistent; leaves entire or slightly 3-lobed on very long stalks; berries small, black, without bloom in long-stalked clusters. Ill. W. and S.

+ + Leaves glabrous and mostly shining, or short-hairy beneath, cut-lobed or undivided.

++ Flowers more or less polygamous (some plants inclined to produce only staminate flowers), exhaling a fragrance like that of Mignonette; native species.

V. cordifòlia, Michx. FROST or CHICKEN G. Leaves thin, heart-shaped, with a deep acute sinus, little lobed, but coarsely and sharply toothed; stipules small; clusters loose; fruit small, bluish, or black with a bloom, very sour, ripe after frosts. Common on banks of streams.

V. ripària, Michx. (or V. VULPÌNA). RIVER G. Leaves usually 3-lobed, sinus broad, rounded, or truncate; stipules large (2″–3″); fruit 4″–5″ diameter, acid, often juicy, ripening July to Sept. Stream banks N. and W. Original, in part, of CLINTON and others.

V. rupéstris, Scheele. SAND G., SUGAR G. Low and bushy, often without tendrils; leaves broadly cordate or kidney-shaped, not acuminate, usually not lobed, but coarsely toothed; berries small in small bunches, sweet; ripe Aug. Wis. to Tenn. and Tex.

++ ++ Flowers all perfect, somewhat fragrant; exotic.

V. vinífera, Linn. EUROPEAN GRAPE. Leaves circular and usually green and shining, thin, the teeth deep and sharp or rounded, when young 5–7-lobed. Cult. from immemorial time; from the East, furnishing the principal grapes of our greenhouses.

§ 2. Bark of stem close and smooth, pale; pith continuous through the nodes; tendrils simple, intermittent.

V. rotundifòlia, Michx. MUSCADINE, BULLACE, or SOUTHERN FOX GRAPE. Leaves rather small, round, seldom slightly lobed, glossy, and mostly smooth both sides, margin coarsely toothed; clusters small; fruit ½′–¾′ diameter, purple, thick-skinned, ripe in early autumn; original of the SCUPPERNONG GRAPE. River banks from Md. and Ky. and Kans., S.

2. CÍSSUS. (Greek: *Ivy.*) Species often referred to Vitis.

** Wild species S. and W., smooth, usually with 5 stamens and petals.*

C. Ampelópsis, Pers. A species with simple leaves like those of a true Grape, heart-shaped or ovate, pointed, coarsely toothed, but not lobed; flower-clusters, small and loose; style slender.

C. stáns, Pers. A bushy or low-climbing plant, with few tendrils, and decompound leaves, the small leaflets cut-toothed.

** * Exotic species, usually with 4 stamens and petals.*

C. discolor, Blume. Leaves lance-oblong, with a heart-shaped base, crimson underneath, velvety lustrous and dark-green, shaded with purple or violet, or often mottled with white; on the upper surface the shoots reddish. Java; cult. in hothouses for its splendid foliage.

3. AMPELÓPSIS. (Greek: *like the vine.*) (Lessons, Figs. 93, 94.) Flowers much like Vitis.

A. quinquefòlia, Michx. Virginia Creeper, Woodbine. In all low grounds, climbing extensively, sometimes by rootlets as well as by the tendrils; leaflets 5, digitate, lance-oblong, cut-toothed, changing to crimson in autumn; flowers cymose in summer; berries small, black or bluish. One form does not cling well.

A. tricuspidàta, Sieb. & Zucc. (or A. Vèitchii). Japan Ivy, Boston Ivy. Branching profusely and adhering tenaciously by much-branched tendrils; leaves very variable, roundish-ovate and crenate-serrate, or cordate, 3-lobed or even 3-foliolate, shining, thickish, finely colored in autumn; cymes much shorter than petioles, inconspicuous. Japan. A handsome hardy climber for covering walls.

A. heterophýlla, Sieb. & Zucc. (or Vitis heterophýlla). Has the small thin leaves variously 3–5-lobed, often blotched or variegated, slender soft canes, and small, porcelain-blue berries. Hardy N. China and Japan. Does not cling.

XXXIII. SAPINDACEÆ, SOAPBERRY FAMILY.

Trees, shrubs, or one or two herbaceous climbers, mostly with compound or lobed leaves, and unsymmetrical flowers, the stamens sometimes twice as many as the petals or lobes of the calyx, but commonly rather fewer, when of equal number alternate with the petals; these imbricated in the bud, inserted on a disk in the bottom of the calyx and often coherent with it; ovary 2–3-celled, sometimes 2–3-lobed, with 1–3 (or in Staphylea several) ovules in each cell. A large and diverse order.

I. SOAPBERRY SUBFAMILY. Flowers often polygamous or diœcious, mostly irregular or unsymmetrical, the embryo coiled or curved, without albumen. No stipules.

* *Leaves alternate, twice ternate and cut-toothed. Pod bladdery-inflated.*

1. CARDIOSPERMUM. Herbs, climbing by hook-like tendrils in the flower clusters. Sepals 4, the inner pair larger. Petals 4, each with an appendage on the inner face, that of the two upper large and petal-like, of the two lower crest-like and with a deflexed spur or process, raised on a claw. Disk irregular, enlarged into two glands, one before each lower petal. Stamens 8, turned towards the upper side of the flower away from the glands, the filaments next to them shorter. Styles or stigmas 3, short: ovary triangular, 3-celled, with a single ovule rising from the middle of each cell. Pod 3-lobed; seeds bony, globose, with a scale-like heart-shaped aril adherent to the base.

* * *Leaves alternate, pinnate.*

2. KŒLREUTERIA. Small tree. Sepals 5. Petals 3 or 4 (the place of the others vacant), each with a small, 2-parted, scale-like appendage attached to its claw. Disk enlarging into a lobe before each petal. Stamens 5–8, declined; filaments hairy. Style single, slender; ovary triangular, 3-celled, with a pair of ovules in each cell. Pod bladdery, 3-lobed, 3-celled.

3. XANTHOCERAS. Shrub. Flowers regular. Sepals 5; petals 5, without a scale. Disk cup-like, with 5 curved, spreading horns alternate with the petals. Stamens 8. Style

grooved, stigmas 3; ovary 3-lobed, 3-celled, with 8 ovules in each cell. Fruit a thick-walled capsule tardily splitting into 3 valves. Seeds globular, ½′ diam., purple brown.

* * * *Leaves opposite, of* 5–9 *digitate leaflets. Pod leathery, not inflated.*

4. ÆSCULUS. Trees or shrubs. Calyx 5-lobed or 5-toothed. Petals 4 or 5, more or less unequal, on claws inclosed in the calyx, not appendaged. Stamens 7, rarely 6 or 8; filaments slender, often unequal. Style single, as also the minute stigma; ovary 3-celled, with a pair of ovules in each cell. Flowers in a terminal crowded panicle, in late spring, or summer. Fruit a leathery pod, splitting at maturity into 3 valves, ripening 1–3 very large, chestnut-like, hard-coated seeds. (Lessons, p. 19, and Figs. 38, 39.)

II. MAPLE SUBFAMILY. Flowers generally polygamous or dicœcious, and sometimes apetalous, a mostly 2-lobed and 2-celled ovary, with a pair of ovules in each cell, ripening a single seed in each cell of the winged fruit. Embryo with long and thin cotyledons, coiled or crumpled. (Lessons, p. 15, Figs. 11–13, etc.) Leaves opposite; no stipules.

5. ACER. Trees or shrubs, with palmately-lobed or even parted leaves. Calyx mostly 5-cleft. Petals as many or none, and stamens 3–8 or rarely more, borne on the edge of the disk. Styles or stigmas 2, slender. Fruit a pair of samaras or key-fruits, united at the base or inner face and winged from the back. Occasionally the ovary is 3-celled and the fruit 3-winged.

6. NEGUNDO. Trees, with pinnate leaves of 3–5 leaflets, and dicœcious, very small flowers, without petals or disk; the calyx minute; stamens 4 or 5. Fruit, etc., of Acer.

III. BLADDER NUT SUBFAMILY. Flowers perfect and regular; stamens as many as the petals; several bony seeds with a straight embryo in scanty albumen, and opposite, compound leaves both stipulate and stipellate.

7. STAPHYLEA. Erect sepals, petals, and stamens 5; the latter borne on the margin of a fleshy disk which lines the bottom of the calyx. Styles 2–3, slender, separate or lightly cohering; ovary strongly 2–3-lobed, in fruit becoming a bladdery 2–3-lobed, 2–3-celled, and several-seeded, large, bladdery pod. Shrubs, with pinnately compound leaves of 3–7 leaflets.

1. CARDIOSPÉRMUM, BALLOON VINE, HEARTSEED. (The latter is a translation of the Greek name.)

C. Halicácabum, Linn. A delicate, climbing herb, or spreading: flowers small, white, in summer. Wild in S. W. States, and cult. for the inflated pods.

2. KŒLREUTÈRIA. (Named for *Kœlreuter*, a German botanist.)

K. paniculàta, Laxm. Leaves of numerous thin and coarsely toothed or cut leaflets, and a panicle of small yellow flowers (in summer) terminal, amply branched. China.

3. XANTHOCÈRAS. (Greek: *yellow horn;* the disk-horned.)

X. sorbifòlia, Bunge. Leaves large, leaflets 11–21 ovate-lanceolate, coarsely serrate; flowers (1′ broad) in dense, raceme-like clusters; petals crumpled, white, marked with yellow, changing to purple. China.

4. ÆSCULUS, HORSE-CHESTNUT, BUCKEYE. (Ancient name of an Oak or other mast-bearing tree, applied to these trees on account of their large, chestnut-like, but unedible or even poisonous, seeds.) (Lessons, Figs. 38, 39, 159, 170.)

* *Petals* 5, *shorter than stamens; fruit prickly.*

Æ. Hippocástanum, Linn. COMMON H. Tall fine tree, with mostly 7 leaflets, and large flowers of 5 petals, white, with yellow spots becoming crimson; stamens 7, at first declined. There are double, variegated, and cut-leaved forms.

* * *Petals* 4, *shorter than the stems.*

+ *Petals broad, spreading on slender claws.*

Æ. rubicúnda, Lois. RED H. Compact, round-headed tree, flowering even as a shrub; leaves rather bright green, of 5–7 leaflets; petals rose-red; stamens mostly 8. Origin unknown; thought to be a hybrid.

Æ. turbinàta, Blume. CHINESE H. A tree, 30° high; leaflets 5–7 obovate-cuneate; panicle a span long, pubescent; flowers whitish, calyx 5-lobed; petals repand-toothed, ciliate; stamens 6 or 7; ovary densely reddish, pubescent.

Æ. Californica, Nutt. CALIFORNIAN H. Low tree; leaflets usually 5, small, oblong-lanceolate, slender-stalked; small, white or rosy-tinged flowers densely crowded in a long pubescent thyrse; calyx 2-lobed; stamens 5–7, slender; ovary hoary, pubescent. Cal.

+ + *Petals erect, and rather narrow, on slender claws.*

Æ. parviflòra, Walt. SMALL BUCKEYE. Shrub 3°–9° high; leaflets 5–7, soft downy underneath; panicle slender, raceme-like, 1° long; stamens twice as long as the narrow white petals; flowering N. as late as midsummer; fruit smooth; seeds small, almost edible. Wild in the upper country S., and planted N.

Æ. glàbra, Willd. FETID or OHIO BUCKEYE. Tall tree; leaflets 5, nearly smooth; panicle short; stamens moderately longer than the somewhat uniform, pale yellow petals; fruit prickly roughened like that of Horse-chestnut. W. of the Alleghanies.

* * * *Petals* 4, *longer than the stamens.*

Æ. flàva, Ait. YELLOW or SWEET BUCKEYE. Tree or shrub; leaflets 5–7, smooth or smoothish; panicle, short, dense; calyx oblong; petals connivent, light yellow, these of two dissimilar pairs, the longer pair with very small blade; fruit smooth. W. and S.

Var. **purpuráscens**, Gray. PURPLISH B. Has both calyx and corolla tinged with purple or reddish, and leaflets generally downy underneath. W. Va., S. and W.

Æ. Pàvia, Linn. RED BUCKEYE. Shrub or low tree, like the last, but leaves generally smooth; the longer and tubular calyx and the petals bright red; the several forms showy in cultivation. S. and W.

5. ÀCER, MAPLE. (The classical Latin name from Celtic, *hard.*) (Lessons, Figs. 11–25, 79, 81, 82, 182, 391.)

* *Flower clusters terminating a shoot of the season, appearing after the leaves.*

+ *Leaves undivided or 3–5-lobed, with as many palmate ribs.*

+ + *Flower clusters erect, rarely drooping.*

A. Tartáricum, Linn. TARTARIAN M. A small tree or shrub; young branches tomentose; leaves ovate or oblong, mostly undivided, incised ser-

rate ; clusters of white flowers short, thyrsoid ; wings of fruit diverging at an acute angle. Leaves very bright colored in autumn. Var. *Ginnàla*. Leaves much longer than broad, mostly deeply 3-lobed. Mediterranean to E. Asia.

A. spicàtum, Lam. Mountain M. Tall shrub or tree ; leaves slightly 3-lobed and coarsely toothed, downy beneath ; spike-like clusters of small greenish-yellow flowers ; fruits with narrow wings diverging at an obtuse angle. Flowers June. N.

+ + Flower clusters pendulous.

A. Pseùdo-Plátanus, Linn. Sycamore M. A fine tree, with spreading branches, ample 5-lobed leaves, whitish and rather downy beneath, on long reddish petioles, the lobes toothed, elongated ; clusters of greenish flowers ; wings of the pubescent fruit moderately spreading. Eu. A great many forms, with golden, purple, or variegated leaves are cult.

A. Pennsylvánicum, Linn. Striped M., Moosewood. Small tree ; bark light green, striped with darker lines ; leaves large, thin, finely sharply serrate all round, and at the end with 3 short and very taper-pointed lobes ; racemes of rather large green flowers, slender and loose ; fruit glabrous with very divergent wings. Common N.

+ + Leaves 7–11-lobed or parted (sometimes dissected), with as many ribs ; flowers in corymbiform clusters.

A. circinàtum, Pursh. Vine M. Spreading shrub or tree ; leaves thin and rounded, moderately 7–9-lobed, the lobes serrate ; drooping clusters of 10–20 purplish flowers ; wings of fruit strongly diverging. Oregon.

A. palmàtum, Thunb. Japan M. A large tree ; leaves 7–11-parted ; the segments narrow, often much laciniate ; small purple flowers in erect clusters. A great number of forms with variously cut and colored leaves in cult. under many names : A. polymórphum, A. Japónicum (of horticulturists, not Thunberg), A. disséctum, etc.

** * Flower clusters corymbiform, terminating shoots of the season, or some from lateral buds, appearing with the leaves.*

+ Sepals distinct ; petals present.

++ Leaves thin, with taper-pointed lobes.

A. platanoìdes, Linn. Norway M. A handsome, round-headed tree ; leaves broad, smooth, bright green both sides, their 5 short lobes set with 2–5 coarse and taper-pointed teeth ; flowers numerous ; fruit flat, smooth, with wings 2′ long diverging in a straight line. Juice milky ; leaves holding green later than others. There are cut and variegated-leaved forms ; also with colored foliage.

A. Lobèlii, Tenore. A tree much resembling the preceding, except that the leaves are 5–7-lobed, with the lobes almost or quite entire. S. Eu. Forms with reddish or variegated leaves are most planted.

A. pictum, Thunb., from Asia, with fruit wings, 1½–2 times the carpel (2–3 times in A. Lobelii), and diverging at a right angle, may be different.

++ + Leaves thickish and firm, lobes blunt.

A. campéstre, Linn. A low shrub or tree ; long-petioled, 5-lobed leaves ; lobes with a few, large blunt teeth ; fruit wings in a line or even recurved. Eu.

+ + Sepals united ; petals 0 ; leaf-lobes taper-pointed.

A. saccharìnum, Wang. Rock or Sugar M. Leaves rather deeply 3–5-lobed, pale or whitish beneath, the sinuses open and rounded, and the lobes with one or two sinuate, coarse teeth ; calyx bell-shaped and hairy-fringed ; wings of fruit ascending, barely 1′ long. Large trees common, especially N., valuable for timber and for the sugar of their sap.

Var. **nigrum**, Torr. and Gray. Black Sugar M. Has leaves green, often downy beneath, thicker and more coriaceous when old, the sinus at the base often closed. Stipules large, early deciduous. Also much planted.

* * * *Flowers in earliest spring much preceding the leaves, in umbel-like clusters from separate lateral buds.*

A. dasycárpum, Ehrh. White or Silver M. A handsome tree; branches long and spreading or drooping; leaves very deeply 5-lobed, silvery-white, and when young downy beneath, the narrow lobes coarsely cut and toothed; flowers greenish; petals 0; fruit woolly when young, but soon smooth, 2′–3′ long, including the great diverging wings. River banks S. and W. Cut-leaved forms are grown.

A. rùbrum, Linn. Red, Soft, or Swamp M. Rather small tree; twigs reddish; leaves moderately 3–5-lobed, whitish beneath, the middle lobe longest, all irregularly serrate; petals linear-oblong; flowers scarlet, crimson, or sometimes yellowish; fruit smooth, with the slightly spreading wings 1′ or less in length, often reddish.

6. NEGÚNDO, BOX ELDER, ASH-LEAVED MAPLE. (Meaningless name.)

N. aceroìdes, Moench. Small tree, twigs light green; leaflets ovate, pointed, coarsely toothed, very veiny. Sterile flowers fascicled on long hairy pedicels; fertile in drooping racemes, all appearing with the leaves. New Eng. S. and W. One form has variegated leaves.

7. STAPHYLÈA, BLADDER NUT. (Greek: *a cluster.*)

* *Leaflets* 3, *ovate, acuminate, serrate.*

S. trifòlia, Linn. American B. Shrub 8°–10° high, branches greenish striped; stipules deciduous; raceme-like clusters of white flowers hanging at the end of the branchlets of the season, in spring; petals longer than sepals; fruit 3-celled. Low ground, common N. and W.

S. Bumálda, DC. Japan B. Leaf edges bristly-serrate; panicled clusters of white flowers, erect or nodding; petals equaling the serrulate sepals; ovary and flattish fruit 2-celled. Japan.

* * *Leaflets mostly* 5, *rarely* 3 *or* 7; *fruit* 3-*celled.*

S. pinnàta, Linn. European B. Leaflets broadly ovate; flowers in small pendulous clusters, 3″–4″ long; sepals little spreading; fruit as broad as long. Eu.

XXXIV. ANACARDIACEÆ, CASHEW FAMILY.

Trees or shrubs, with resinous or acrid, sometimes poisonous, often colored or milky juice; alternate leaves without stipules; small flowers (often polygamous) with sepals, petals, and stamens 5; and a 1-celled, 1-ovuled ovary, bearing 3 styles or stigmas:—represented by the genus

1. RHÚS, SUMACH. (Ancient name.) Flowers whitish or greenish; stamens inserted under the edge or between the lobes of a flattened disk in the bottom of the calyx; fruit a small dry or berry-like drupe the solitary seed on a curved stalk rising from the bottom of the cell.

§ 1. *Leaves compound; fruit symmetrical, with style terminal.*

* *Flowers whitish, in large and very compact terminal panicles, in early summer, succeeded by a compact mass of crimson fruit, beset with reddish acid hairs; not poisonous. Leaves pinnate.*

+ *Petioles not winged; leaflets glabrous or hairy only on veins beneath.*

R. týphina, Linn. Staghorn Sumach. Shrub or tree, 10°–30° high; juice resinous-milky; branches and stalks velvety-hairy; large leaves of 11–31 lance-oblong, pointed, and serrate leaflets. Hillsides; also planted. There is a cut-leaved form in cultivation.

R. glàbra, Linn. Smooth S. Shrub 2°–12° high, like the last, but smooth, the leaflets whitened beneath. — Var. **laciniàta**, in Penn., has the leaflets cut into narrow, irregular lobes; planted. Rocky places.

+ + *Petioles winged or margined; leaflets densely pubescent beneath.*

R. copallìna, Linn. Dwarf S. Shrub 1°–5° high, spreading by subterranean shoots; stalks and branches downy; leaflets 9–21, oblong or lance-ovate oblique, entire or serrate, thickish and shining above; panicle ½ as long as leaves; drupes sparsely pilose; juice resinous. Rocky or sandy ground.

R. semialàta, Murr., var. ***Osbéckii***, DC. Winged S. A small tree or shrub; leaflets 4–6 pairs, sessile, crenate-serrate; panicle very large, equaling the leaves; drupes densely tomentose. Japan.

* * *Flowers in slender axillary panicles, in summer; fruit smooth, white or dun-color; leaves pinnate or trifoliate, poisonous to the touch for most people, the juice resinous.*

R. venenàta, DC. Poison Sumach, P. Elder, or P. Dogwood. Shrub 6°–18° high, smooth, with pinnate leaves of 7–13 obovate, entire leaflets, and very slender panicles. More virulent than the next. Swampy ground.

R. Toxicodéndron, Linn. Poison Ivy or Poison Oak. Climbing by rootlets over rocks, etc., or ascending trees; leaflets 3, rhombic-ovate, often sinuate or cut-lobed, rather downy beneath. A vile pest. Common in low grounds. Var. **radìcans** is more erect, less poisonous, with more entire leaves.

* * * *Flowers light yellow, dicœcious, in small, scaly-bracted and catkin-like spikes, in spring before the leaves appear; leaves of 3 cut-lobed leaflets.*

R. Canadénsis, Marsh. Fragrant S. A straggling bush, with the small, rhombic-ovate leaflets pubescent when young, aromatic-scented. Rocky places from Vermont W. and S.

Var. **trilobàta**, Gray, far westward, has smaller crenate leaflets.

§ 2. *Leaves simple, entire; fruit gibbous, the remains of the style lateral; flowers in loose, ample panicles; pedicels elongating and becoming feathery.*

R. Còtinus, Linn. Smoke Tree or Venetian Sumach. Shrub 5°–9° high, smooth, with obovate leaves on slender petioles; fruits very few, half-heart-shaped; usually most of the flowers are abortive, while their pedicels lengthen, branch, and bear long plumy hairs, making large and light, feathery, or cloud-like bunches, either greenish or tinged with red. In common cultivation.

R. cotinoìdes, Nutt. Leaves thin, oval, 3′–6′ long. Otherwise as in the preceding. Mo., Tenn., and S.

XXXV. POLYGALACEÆ, POLYGALA FAMILY.

Bitter, some of them medicinal plants, represented mainly, and here wholly, by the genus

1. **POLÝGALA**, MILKWORT. (Greek: *much milk;* from a notion that in pasturage they increased the milk of cows.) Flowers remarkably irregular, in outward appearance as if papilionaceous like those of the next family, but really of a quite different structure; calyx persistent, of 5 sepals; 3 of them small, viz. 2 on the lower, and 1 on the upper side of the blossom; and 1 on each side called *wings*, which are larger, colored, and would be taken for petals. Within these, on the lower side, are 3 petals united into 1 body, the middle one keel-shaped and often bearing a crest or appendage. Stamens 6 or 8; filaments united below into a split sheath, separating above usually in 2 equal sets, concealed in the hooded middle petal; style curved and commonly enlarged above or variously irregular; ovary 2-celled, with a single ovule hanging from the top of each cell, becoming a small, flattish, 2-seeded pod; seed with an appendage at the attachment (*caruncle*); leaves simple, entire, without stipules. Our native species are numerous, mostly with small or even minute flowers, and are rather difficult to study.

§ 1. *Low herbs, mostly smooth; native species.*

* *Perennial or biennial; flowers purple or white; leaves alternate.*

+ *Flowers rose-purple, showy, also with cleistogamous flowers on subterranean branches.*

P. paucifòlia, Willd. FRINGED POLYGALA, FLOWERING WINTERGREEN. Stems 3′–4′ high, from long, slender, subterranean shoots; leaves few and crowded at the summit, ovate, petioled, some of them with a slender-peduncled flower in the axil, almost an inch long, with a conspicuous fringed crest; stamens 6; in spring. ♃ Light soil in woods, chiefly N.

P. polýgama, Walt. Stems 5′–8′ high, tufted and very leafy; leaves linear-oblong or oblanceolate; flowers many in racemes, their crest conspicuous. Flowers all summer. ② Sandy soil.

+ + *Flowers white, small (in late spring) in a close spike terminating simple tufted stems which rise from a perennial root, none subterranean; leaves numerous, all alternate.*

P. Sénega, Linn. SENECA SNAKEROOT. 6′–12′ high; leaves short, lanceolate, or oblong, or even lance-ovate; spike cylindrical; wings round-obovate; crest small. A medicinal plant; N. Eng. to Minn. and S.

P. álba, Nutt. 1° high, slender; leaves narrow-linear; spike tapering, long-peduncled, and wings oblong-obovate. Common only far W. and S. W.

* * *Annuals; leaves all alternate; flowers purple or rose-color, in a terminal spike, head, or raceme all summer; none subterranean.*

+ *Keel conspicuously crested; claws of the true petals united into a long and slender cleft tube, much surpassing the wings.*

P. incarnàta, Linn. From Penn. W. and S.; stem slender, 6′–12′ high; leaves minute and awl-shaped; the 3 united petals extended below into a long and slender tube, the crest of the middle one conspicuous.

+ + *Keel minutely or inconspicuously crested; true petals not longer (mostly shorter) than the wings.*

P. sanguínea, Linn. Stem 4′–8′ high, leafy to the top; leaves oblong-linear; flowers bright rose-purple (sometimes pale or even white), in a thick, globular at length oblong head or spike, without pedicels. Sandy, damp ground.

P. fastigiàta, Nutt. Slender, 4′–10′ high, with smaller narrow-linear leaves, and oblong dense spike of smaller rose-purple flowers on pedicels as long as the pod; bracts falling off with flowers or fruits. Pine barrens from N. J., S.

P. Nuttállii, Torr. & Gray. Lower than the foregoing; flowers rather looser in more cylindrical spikes, greenish-purple; awl-shaped bracts remaining on the axis after the flowers or fruits have fallen. Sandy soil, coast of Mass., S. and W.

* * * *Annuals with at least the lower leaves in whorls of* 4, *sometimes in* 5's; *spikes terminal; flowers summer and autumn.*

+ *Spikes short and thick* (4″–9″ *diameter*); *bracts persisting; flowers rose or greenish-purple; crest small.*

P. cruciàta, Linn. Stems 3′–10′ high, 4-angled, and with spreading branches; leaves linear or spatulate; spike nearly sessile; wings of the flower broad-ovate or heart-shaped, bristle-pointed. Low grounds.

P. brevifòlia, Nutt. Stems slender; leaves narrower, those on the branches alternate; spike stalked; wings of the flower lance-ovate and nearly pointless. Sandy bogs R. I., S.

+ + *Spikes slender* (2″ *diameter*); *bracts falling; flowers* (*all summer*) *greenish-white or scarcely tinged with purple, very small.*

P. verticillàta, Linn. Stem 6′–10′ high, much branched; all the leaves of the main stem whorled. Dry soil, common.

Var. **ambígua**, Wats. More slender; only the lowest leaves whorled; flowers more scattered and often purplish-tinged, in long-peduncled spikes. N. Y. to Mo. and S.

* * * * *Biennials or annuals; flowers yellow, some turning green in drying, in dense spikes or heads; leaves alternate. Growing in low or wet places in pine barrens, S. E. Flowers summer.*

+ *Short and thick spike or head single; root leaves clustered.*

P. lùtea, Linn. Yellow Bachelor's Button of S. Stem 5′–12′ high; lower leaves spatulate or obovate, upper lanceolate; flowers bright orange. N. J. and S.

+ + *Numerous short spikes or heads in a cyme.*

P. ramòsa, Ell. Stem 6′–12′ high, more branched; lowest leaves obovate or spatulate, upper ones lanceolate; a caruncle at base of seed. Del. and S.

P. cymòsa, Walt. Stem 1°–3° high, branching at top into a compound cyme of spikes; leaves linear, acute, the uppermost small; no caruncle to the seed. From Del. S.

§ 2. *Shrubby species of the conservatory, from the Cape of Good Hope.*

P. oppositifòlia, Linn. Leaves opposite, sessile, heart-shaped and mucronate, of a pale hue; flowers large and showy purple with a tufted crest.

P. myrtifòlia, Linn. Leaves crowded, alternate, oblong or obovate, on short petioles; showy purple flowers 1′ long, with a tufted crest.

XXXVI. LEGUMINOSÆ, PULSE FAMILY.

Distinguished by the papilionaceous corolla (Lessons, Figs. 261, 262), usually accompanied by 10 monadelphous or diadelphous or rarely distinct stamens (Lessons, Figs. 287, 288) and the legume (Lessons, Figs. 393, 394). These characters are combined in the proper Pulse Subfamily. In the two other great divisions the corolla becomes less papilionaceous or wholly regular. Alternate leaves, chiefly compound, entire leaflets, and stipules, are almost universal in this great family.

I. PULSE SUBFAMILY. Flower (always on the plan of 5, and stamens not exceeding 10) truly papilionaceous, i.e. the standard outside of and in the bud enwrapping the other petals, or only the standard present in Amorpha. (For the terms used to denote the parts of this sort of corolla, see Lessons, p. 91.) Sepals united more or less into a tube or cup. Leaves never twice compound, alternate in mature plants.

A. *Stamens separate to the base.* (*Plants not twining or climbing.*)

* *Leaves simple or of* 3 *digitate leaflets.*

1. CHORIZEMA. Somewhat shrubby, with simple and spiny-toothed leaves, scarcely any stipules, and orange or copper-red flowers. Standard rounded, kidney-shaped; keel straight, much shorter than the wings. Pod ovoid, turgid, several-seeded.
2. BAPTISIA. Herbs, with simple entire sessile leaves and no stipules, or mostly of 3 leaflets with deciduous or persistent stipules. Flowers yellow, blue, or white. Standard erect, with the sides turned back, about equaled by the oblong and straightish wings and keel. Pod inflated, coriaceous, stalked in the calyx, many-seeded.
3. THERMOPSIS. Pod linear, flat. Flowers yellow. Leaflets obovate or oblong. Otherwise as Baptisia.

* * *Leaves odd-pinnate.*

4. CLADRASTIS. Trees, with large leaflets, no obvious stipules, and hanging terminal panicles of white flowers. Standard turned back; the nearly separate straightish keel-petals and wings oblong, obtuse. Pod short-stalked in the calyx, linear, very flat, thin, marginless, 4–6-seeded. Base of the petioles hollow and covering the axillary leaf-buds of the next year.
5. SOPHORA. Trees, shrubs, or herbs, with numerous leaflets, and mostly white or yellow flowers in terminal racemes or panicles. Keel-petals and wings oblong, obtuse, usually longer than the broad standard. Pod commonly stalked in the calyx, terete, several-seeded, fleshy or almost woody, hardly ever opening, but constricted across into mostly 1-seeded portions.

B. *Stamens monadelphous or diadelphous.*

§ 1. *Herbs, shrubs, or one a small tree, never twining, trailing, or tendril bearing, with leaves simple or of* 3 *or more digitate leaflets, monadelphous stamens, and the alternate* 3 *anthers differing in size and shape from the other* 5*; pod usually several-seeded.*

* *Leaves* (*in our species*) *all simple.*

6. CROTALARIA. Leaves with foliaceous stipules free from the petiole but running down on the stem. Calyx 5-lobed. Keel scythe-shaped, pointed. Stamens with the tube of filaments split down on the upper side. Pod inflated. Ours herbs.

7. GENISTA. Leaves entire; stipules very minute or none. Calyx 5-cleft. Keel oblong, nearly straight, blunt, turned down when the flower opens. Pod mostly flat. Low shrubby plants.
8. ULEX. Leaves reduced to a thorn-like petiole or sharp scale; stipules 0. Calyx 2-parted, upper segment 2- lower 3-toothed. Keel oblong, erect. Ovary sessile; pod ovate-oblong to short linear. Seeds with strophiole. Densely spiny shrubs, with yellow flowers in the axils of the upper leaves.

* * *Leaves (except the uppermost in No.* 9 *and one of No.* 11*) compound.*

9. CYTISUS. Leaves of 1 or 3 leaflets, or the green branches sometimes leafless; stipules minute or wanting. Calyx 2-lipped or 5-toothed. Keel straight or somewhat curved, blunt, soon turned down. Style incurved or even coiled up after the flower opens. Pod flat. Seeds with a fleshy or scale-like appendage (strophiole) at the scar. Low shrubby plants.
10. LABURNUM. Leaves of 3 leaflets; stipules inconspicuous or wanting. Calyx with 2 short lips, the upper lip notched. Keel incurved, not pointed. Ovary and flat pod somewhat stalked into the calyx. Seeds naked at the scar. Trees or shrubs, with golden yellow flowers in long, hanging racemes.
11. LUPINUS. Leaves of several leaflets, in one species simple; stipules adherent to the base of the petiole. Flowers in a long, thick raceme. Calyx deeply 2-lipped. Corolla of peculiar shape, the sides of the rounded standard being rolled backwards, and the wings lightly cohering over and inclosing the narrow and incurved scythe-shaped or sickle-shaped keel. Pod flat. Mostly herbs.

§ 2. *Herbs, never twining or tendril-bearing, with leaves of* 3 *leaflets (rarely more, but then digitate), their margins commonly more or less toothed (which is remarkable in this family); stipules conspicuous and united with the base of the petiole* (Lessons, p. 66, Fig. 177); *stamens diadelphous; pod* 1*-few-seeded, never divided across into joints.*

* *Leaves pinnately* 3*-foliolate, as is seen by the end leaflet being jointed with the common petiole above the side leaflets.*

12. MELILOTUS. Herbage sweet-scented. Flowers small, in slender racemes. Corolla as in Medicago. Pod small, but exceeding the calyx, globular, wrinkled, closed, 1–2-seeded.
13. MEDICAGO. Flowers small, in spikes, heads, etc. Corolla short, not united with the tube of stamens. Pod curved or coiled up, at least kidney-shaped.

* * *Leaves mostly digitate or palmately* 3*-foliolate, all (with one exception) borne directly on the apex of the common petiole.*

14. TRIFOLIUM. Flowers in heads, spikes, or head-like umbels. Calyx with slender or bristle-form teeth or lobes. Corolla slowly withering or becoming dry and permanent after flowering; the claws of all the petals (except sometimes the standard) more or less united below with the tube of stamens or also with each other. Pod small and thin, single-few-seeded, generally included in the calyx or the persistent corolla.

§ 3. *Herbs or woody plants, often twining but never tendril-bearing, with the leaves not digitate, or even digitately* 3*-foliolate (except in* Psoralea*), and the leaflets not toothed. Stipules, except in Nos.* 23, 28, *and* 33, *not united with the petiole. (Here might be sought No.* 51.)

* *Flowers (small, in spikes or heads) indistinctly or imperfectly papilionaceous. Pod very small and usually remaining closed, only* 1*-*2*-seeded. Calyx* 5*-toothed, persistent. Leaves odd-pinnate, mostly dotted with dark spots or glands.*

\+ *Petals* 5*, on very slender claws; stamens monadelphous in a split tube.*

15. PETALOSTEMON. Herbs, with crowded leaves. Four petals similar, spreading, borne on the top of the tube of the stamens; the fifth (answering to the standard) rising from the bottom of the calyx, and heart-shaped or oblong. Stamens only 5.
16. DALEA. Herbs, as to our species. Flowers as in the last, but rather more papilionaceous, 4 of the petals borne on the middle of the tube of 10 stamens.

+ + Petal only one. Stamens monadelphous only at the very base.

17. AMORPHA. Shrubs, with leaves of many leaflets. Standard (the other petals wholly wanting) wrapped around the 10 filaments and style. Flowers violet or purple, in single or clustered terminal spikes.

** * Flowers (large and showy, in racemes) incompletely papilionaceous from the wings or the keel also being small and inconspicuous. Pod several-seeded.*

(31. ERYTHRINA. Herbs or shrubs, with 3 leaflets. Standard large and showy and mostly erect. Pod torulose or knotty.)

** * * Flowers obviously papilionaceous, all the parts conspicuously present. Stamens mostly diadelphous.*

+ Herbage glandular-dotted.

18. PSORALEA. Leaves of 3 or 5 leaflets. Flowers (never yellow) in spikes or racemes, often 2 or 3 under each bract. Pod ovate, thick, included or partly so in the 5-cleft persistent calyx, often wrinkled.

+ + Herbage not glandular-dotted.

++ Pod not jointed (or very slightly so in No. 20); leaflets more than 4; herbs, shrubs, or trees, never twining or trailing if herbs.

= Perennial herbs (in ours), mostly more or less hairy.

o Standard broad.

19. TEPHROSIA. Leaflets obliquely parallel-veined, often silky beneath, and white or purple flowers (2 or more in a cluster) in racemes; the peduncles terminal or opposite the leaves. Calyx 5-cleft or 5-toothed. Standard rounded, silky outside. Style incurved, rigid; stigma with a tuft of hairs. Pod linear, several-seeded.

20. SESBANIA. Many pairs of leaflets, and minute or early deciduous stipules. Flowers in axillary racemes, or sometimes solitary, yellow. Calyx short, 5-toothed. Standard rounded, spreading; keel and style incurved. Pod usually intercepted internally with cellular matter or membrane between the seeds.

o o Standard narrow.

21. INDIGOFERA. Herbs, or sometimes shrubby; when pubescent, the close-pressed hairs are fixed by the middle. Flowers rose-color, purple, or white, in axillary racemes or spikes, mostly small. Calyx 5-cleft. Standard roundish, often persistent after the rest of the petals have fallen; keel with a projection or spur on each side. Anthers tipped with a little gland or blunt point. Pod oblong, linear, or of various shapes, commonly with membranous partitions between the seeds.

22. ONOBRYCHIS. Leaves odd-pinnate, of numerous leaflets. Flowers racemed, rose-purple. Pod flattish, wrinkled, and spiny-roughened or crested.

23. ASTRAGALUS. Without stipels, and with white, purple, or yellowish rather small flowers in spikes, heads, or racemes; peduncles axillary. Corolla narrow; standard erect, mostly oblong. Style and stigma smooth and beardless. Pod commonly turgid or inflated, and within more or less divided lengthwise by intrusion of the back or a false partition from it.

= = Trees or shrubs.

24. ROBINIA. Trees or shrubs, with netted-veined leaflets furnished with stipels, and often with sharp spines or prickles for stipules. Flowers large and showy, white or rose-color, in axillary racemes. Base of the leafstalk hollow and covering the axillary bud of the next year. Calyx 5-toothed, the two upper teeth partly united. Standard large, turned back; keel incurved, blunt. Ovary stalked in the calyx. Pod broadly linear, flat, several-seeded, margined on the seed-bearing edge, the valves thin.

25. CARAGANA. Shrubs, with mostly fascicled leaves of several pairs of leaflets, and a little spiny tip in place of an end leaflet; stipules minute or spiny. Flowers solitary or 2–3 together on short peduncles, yellow. Calyx bell-shaped or short-tubular, 5-toothed. Standard nearly erect, with the sides turned back; the blunt keel and the style nearly straight. Pod linear, several-seeded.

26. COLUTEA. Shrubs, not prickly, and no stipules to the leaflets; the flowers rather large, yellow or reddish, in short axillary racemes. Calyx 5-toothed. Standard

rounded, spreading; keel strongly incurved, blunt, on long, united claws. Style incurved, bearded down one side. Pod raised out of the calyx on a stalk of its own, thin and bladdery-inflated, flattish on the seed-bearing side, several-seeded.

= = = *Woody climbers.*

27. WISTARIA. High climber, with numerous leaflets, and large, showy, bluish flowers, in hanging, terminal, dense racemes. Calyx with 2 short teeth on the upper, and longer ones on the lower, side. Standard large, roundish, turned back; keel merely incurved, blunt. Pod knobby, several-seeded.

++ ++ *Pod jointed or constricted between the seeds (joint rarely reduced to* 1*); leaflets* 3 *or more; herbs (or No.* 31 *woody at base), not twining or trailing.*

= *Leaflets* 3 *(or rarely but* 1 *in No.* 30*).*

○ *Flowers yellow.*

28. STYLOSANTHES. Flowers in heads or short spikes, leafy-bracted. Calyx with a slender stalk-like tube, and 4 lobes in the upper lip, one for the lower. Stamens monadelphous; 5 longer anthers fixed by their base, 5 alternate ones by their middle. Pod flat, reticulated, sometimes raised on a stalk-like, empty, lower joint. Stipules united with the petiole.

○ ○ *Flowers purple to white.*

29. LESPEDEZA. Stipules small and free, or falling early. Flowers in spikes, clusters, or panicled, or scattered. Stamens diadelphous; anthers uniform. Pod flat and thin, ovate or orbicular, reticulated, sometimes raised on a stalk-like, empty, lower joint.

30. DESMODIUM. Leaflet rarely only 1, stipellate. Pod of very flat joints (Lessons, p. 122, Fig. 394), usually roughish and adhesive by minute-hooked pubescence. Herbs, with small flowers, in racemes, which are often panicled.

31. ERYTHRINA. Shrubby, or from a woody base. Stem, branches, and even the leaf-stalks usually prickly. Flowers large and showy, usually red, in racemes. Wings, and sometimes keel small and inconspicuous. Calyx without teeth. Standard elongated; wings often wanting or so small as to be concealed in the calyx; keel much shorter than the standard, sometimes very small. Pod stalked in the calyx, linear, knobby, usually opening only down the seed-bearing suture. Seeds scarlet.

32. GLYCINE. Leaflets large, thin, and bean-like. Stipules very small and free, usually persistent. Flowers small and hairy, in short, axillary racemes, the calyx toothed. Pod flat and bean-like, short, in ours hanging, very hairy. Seed mostly short or globular, and somewhat pea-like. Strong, erect, hairy herbs.

= = *Leaflets more than* 3.

○ *Leaflets* 4.

33. ARACHIS. Annual. Flowers small, yellow, in axillary heads or spikes. Calyx with one narrow lobe making a lower lip, the upper lip broad and 4-toothed, and a long, thread-shaped or stalk-like tube. Keel incurved and pointed. Stamens monadelphous, 5 anthers longer and fixed by or near their base, the alternate ones short and fixed by their middle. Ovary at the bottom of the very long and stalk-like tube of the calyx, containing 2 or 3 ovules; when the long style and the calyx with the rest of the flower falls away, the forming pod is protruded on a rigid, deflexed stalk which then appears, and is pushed into the soil, where it ripens into the oblong, reticulated, thick, coriaceous fruit, which contains the 1–3 large and edible seeds; the embryo composed of a pair of very thick and fleshy cotyledons and an extremely short, nearly straight, radicle.

○ ○ *Leaflets* 5 *or more, often many.* (*No.* 20 *may be sought here.*)

34. ÆSCHYNOMENE. Leaflets several, odd-pinnate, small. Pod of very flat joints. Herbs, with small yellow flowers (sometimes purplish externally), few or several on axillary peduncles.

35. CORONILLA. Leaflets several, odd-pinnate, small. Pod of thickish, oblong or linear joints. Herbs or shrubs, with flowers in head-like umbels raised on slender, axillary peduncles.

++++ *Pod not jointed; leaves* 3- (*rarely* 1-, *or in No.* 46, *and one of* 44, 5-9-) *foliolate, herbs* (*or No.* 43 *a woody greenhouse plant*) *with a twining or trailing habit.* (*In some Beans the twining habit has disappeared.*)

= *Leaves* 3-*foliolate* (*or in No.* 36 *sometimes* 1-*foliolate, and in one of No.* 44, 7-9-*pinnate*).

o *Flowers yellow* (*sometimes purple-tinged outside*); *ovules only* 2; *pod* 1-2-*seeded; leaflets not stipellate.*

36. RHYNCHOSIA. Keel of the corolla incurved at the apex; standard spreading. Calyx 4-5-parted or lobed. Pod short and flat. Flowers small. Leaves mostly soft-downy and resinous-dotted, sometimes of a single leaflet.

o o *Flowers not yellow; seeds, or at least the ovules, several; leaflets stipellate.*

x *Style variously bearded or hairy.*

37. PHASEOLUS. Keel of the corolla, with included stamens and style, coiling into a spiral, usually with a tapering blunt apex; standard rounded, turned back or spreading. Style bearded down the inner side; stigma oblique or lateral. Pod scimiter-shaped. Flowers usually clustered on the knotty joints of the raceme. Stipules striate, persistent.

38. VIGNA. Keel curved, either blunt or produced into a curved (not spiral) beak, about equal to the wings; standard nearly orbicular. Style hairy above; stigma strongly oblique or introrse. Otherwise like Phaseolus.

39. DOLICHOS. Keel of the corolla narrow and bent inwards at a right angle, but not coiling. Style bearded under the terminal stigma. Stipules small. Otherwise nearly as Phaseolus.

40. STROPHOSTYLES. Keel with included stamens and style elongated, strongly incurved, but not spirally coiled. Style bearded lengthwise. Pod linear, terete or flattish, nearly straight. Flowers few, sessile in capitate clusters on the mostly long peduncles. Otherwise as in Phaseolus.

41. CENTROSEMA. Keel broad, incurved, nearly equaling the wings; standard large and rounded, spreading, and with a spur-like projection behind. Calyx short, 5-cleft. Style bearded only at the tip around the stigma. Pod long, linear, with thickened edges bordered by a raised line on each side. Flowers showy. Stipules, bracts, and bractlets striate, persistent.

42. CLITORIA. Keel small, shorter than the wings, incurved, acute; standard much larger than the rest of the flower, notched at the end, erect. Calyx tubular, 5-toothed. Style bearded down the inner side. Pod oblong-linear, flattish, not bordered. Flowers large and showy, 1-3 on a peduncle. Stipules, bracts, and bractlets persistent, striate.

x x *Style naked.*

43. KENNEDYA. Keel incurved, blunt or acute, mostly equaling or exceeding the wings; standard broad, spreading. Calyx 5-lobed; 2 upper lobes partly united. Pod linear, not bordered. Flowers showy, red, single or few on the peduncle. Bracts and stipules striate.

44. GALACTIA. Keel straightish, blunt, as long as the wings; standard turned back. Calyx of 4 pointed lobes, upper one broadest. Pod flattened, mostly linear. Flowers clustered on the knotty joints of the raceme; flower-buds taper-pointed. Stipules and bracts small or deciduous.

45. AMPHICARPÆA. Keel and very similar wings nearly straight, blunt; the erect standard partly folded around them. Calyx tubular, 4-toothed. Flowers small; those in loose racemes above often sterile, their pods, when formed, scimiter-shaped and few-seeded; those at or near the ground or on creeping branches very small and without manifest corolla, but very fertile, making small and fleshy, obovate or pear-shaped, mostly subterranean, pods, ripening one or two large seeds. Bracts rounded and persistent, striate, as are the stipules.

= = *Leaves* 5-7-*foliolate.*

46. APIOS. Herbs, twining over bushes, bearing sweet-scented chocolate-purple flowers, in dense and short racemes; peduncles axillary. Calyx with 2 upper very short teeth, and 1 longer lower one, the side teeth nearly wanting. Standard very broad, turned back; keel long and scythe-shaped, strongly incurved, or at length coiled. Pod linear, flat, almost straight, several-seeded.

§ 4. *Herbs, with abruptly pinnate leaves, the common petiole terminated by a tendril, by which the plant climbs or supports itself, or in many low species the tendril reduced to a mere bristle or tip, or in* Cicer, *which has toothed leaflets, an odd leaflet commonly takes its place; peduncles axillary; stamens almost always diadelphous. Cotyledons very thick, so that they remain underground in germination, as in the Pea.*

* *Leaflets entire or sometimes toothed at the apex; radicle bent on the cotyledons; style inflexed and bearded; pod flat or flattish.*

47. PISUM. Lobes of the calyx leafy. Style rigid, dilated above and the margins reflexed and joined together so that it becomes flattened laterally, bearded down the inner edge. Pod several-seeded; seeds globose. Flowers large. Leaflets only 1–3 pairs.

48. LATHYRUS. Lobes of the calyx not leafy. Style flattened above on the back and front, bearded down one face. Pod several-seeded. Seeds sometimes flattish. Leaflets few or several pairs.

49. VICIA. Style slender, bearded or hairy only at the apex or all round the upper part. Pod 2–several-seeded. Seeds globular or flattish. Leaflets few or many pairs.

50. LENS. Lobes of the calyx slender. Style flattish on the back, and minutely bearded down the inner face. Pod 1–2-seeded. Seeds flattened, lenticular. Flowers small.

* * *Leaflets toothed all round, and usually an odd one at the end in place of a tendril; style incurved, naked; radicle of the embryo almost straight.*

51. CICER. Calyx 5-parted. Pod turgid oblong, not flattened, 2-seeded. Seeds large, irregularly rounded-obovate, pointed. Peduncle mostly 1-flowered.

II. BRASILETTO SUBFAMILY. Flowers more or less irregular, but not papilionaceous; when they seem to be so, the petal answering to the standard will be found to be *within* instead of outside the other petals. Stamens 10 or fewer, separate. The leaves are sometimes twice pinnate, which is not the case in the true Pulse Family. Embryo of the seed straight, the radicle not turned against the edge of the cotyledons.

* *Leaves simple and entire. Corolla appearing as if papilionaceous.*

52. CERCIS. Trees, with rounded heart-shaped leaves, minute, early, deciduous stipules, and small but handsome red-purple flowers in umbel-like clusters on old wood, earlier than the leaves, rather acid to the taste. Calyx short, 5-toothed. Petals 5, the one answering to the standard smaller than the wing-petals and covered by them; the keel-petals larger, conniving but distinct. Stamens 10, declining with the style. Pod linear-oblong, flat, thin, several-seeded, one edge wing-margined.

* * *Leaves simply abruptly pinnate. Calyx and corolla almost regular.*

53. CASSIA. Flowers in ours yellow. Calyx of 5 nearly separate sepals. Petals 5, spreading, unequal (the lower larger) or almost equal. Stamens 10 or 5, some of the upper anthers often imperfect or smaller, their cells opening by a hole or chink at the apex. Pod many-seeded.

* * * *Leaves, or at least some of them, twice-pinnate.*

54. CÆSALPINIA. Trees or shrubs, chiefly tropical, with mostly showy red or yellow perfect flowers. Calyx deeply 5-cleft. Petals 5, broad, spreading, more or less unequal. Stamens 10, declining, along with the thread-shaped style. Pod flat.

55. GYMNOCLADUS. Tall, thornless tree, with large compound leaves, no stipules, and diœcious or polygamous, whitish, regular flowers in corymb-like clusters or short racemes terminating the branches of the season. Calyx tubular below, and with 5 spreading lobes, the throat bearing 5 oblong petals and 10 short stamens, those of the fertile flowers generally imperfect. Pod oblong, flat, very hard, tardily opening, with

a little pulp or sweetish matter inside, containing few or several large and thick hard seeds (over ½′ in diameter); the fleshy cotyledons remaining underground in germination.

56. GLEDITSCHIA. Thorny trees, with abruptly twice-pinnate or some of them once pinnate leaves, the leaflets often crenate-toothed, inconspicuous stipules, and small, greenish, polygamous flowers in narrow racemes. Calyx 3–5-cleft, the lobes and the 3–5 nearly similar petals narrow and spreading. Stamens 3–10. Pod flat, very tardily opening, often with some sweetish matter around the 1–several flat seeds. Cotyledons thin.

III. MIMOSA SUBFAMILY. Flowers perfectly regular, small, crowded in heads or spikes; both calyx and corolla valvate in the bud; and the 4 or 5 sepals usually, and petals frequently, united more or less below into a tube or cup. Stamens 4, 5, or more, often very many, usually more conspicuous than the corolla and brightly colored, the long capillary filaments inserted on the receptacle or base of the corolla. Embryo of the seed straight. Leaves almost always twice-pinnate and with small leaflets, or apparently simple and parallel-veined when they have phyllodia (Lessons, p. 61) in place of true leaves. The foliage and the pods only show the leguminous character.

* *Stamens once or twice as many as the petals*, 4–10. *Ours herbs or nearly so, with rose-colored or whitish flowers, and leaves of many small leaflets.*

57. MIMOSA. Calyx commonly minute or inconspicuous. Corolla of 4 or 5 more or less united petals. Pod flat, oblong, or linear; when ripe the valves fall out of a persistent, slender margin or frame, and also usually break up into one-seeded joints.

58. SCHRANKIA. Calyx minute. Corolla funnel-form, the 5 petals being united up to the middle. Stamens 10. Pod rough-prickly all over, long and narrow, splitting lengthwise when ripe into 4 parts.

59. DESMANTHUS. Calyx 5-toothed. Corolla of 5 separate petals. Stamens 5 or 10. Pod flat, smooth, linear or oblong, 2-valved, no persistent margin.

* * *Stamens numerous, or more than* 10. *Ours all shrubs or trees.*

60. ALBIZZIA. Flowers yellow or rose-color to nearly white; the long stamens monadelphous at the base. Corolla funnel-form, the 5 petals united beyond the middle. Pod flat and thin, broadly linear, not opening elastically. Leaves twice pinnate.

61. ACACIA. Flowers yellow or straw-color; the stamens separate and very numerous. Corolla of 4 or 5 separate or partly united small petals. Pod various.

1. CHORIZÈMA. (Greek, of no application.) ♃ Greenhouse plants from Australia.

C. ilicifòlium, Labill. HOLLY-LEAVED C. Bushy, with lance-oblong leaves cut into strong spiny teeth or lobes, and racemes of small copper-colored flowers, the wings redder.

C. vàrium, Benth. Leaves round-cordate, nearly sessile, spiny-toothed or entire; flowers yellow and red.

2. BAPTÍSIA, FALSE INDIGO. (Greek: *dye*, some species yielding a poor sort of indigo.) Foliage of most species turning blackish in drying; nearly all grow in sandy or gravelly dry soil; flowers spring and early summer. ♃

** Flowers yellow; leaves simple, perfoliate.*

B. perfoliàta, R. Br. Low and spreading, smooth and glaucous; leaves round-ovate; flowers single, small, axillary; pod small and globular. Carolina and Georgia.

** * Flowers yellow; leaves compound, of 3 leaflets.*

B. tinctòria, R. Br. Wild Indigo. Pale or glaucous, smooth, bushy, 2° high; petiole very short; leaflets small, wedge-obovate; stipules minute, deciduous; racemes few-flowered, terminating the branches; pods small, globular. Common.

B. villòsa, Ell. Minutely downy, stout stems, 2° high; leaflets spatulate-oblong or wedge-obovate, becoming smooth above; petiole very short; stipules more or less persistent; many-flowered racemes of large flowers on slender pedicels; pod minutely downy, oblong, taper-pointed. Va. to N. C. and Ark.

B. lanceolàta, Ell. Downy when young; leaflets thickish, blunt, lanceolate to obovate, very short; petiole spreading; stipules small, deciduous; flowers rather large, solitary in the axils and in short terminal racemes; pod globular, slender-pointed. Common S. and S. W.

** * * Flowers white, or cream-color; leaves all of 3 wedge-obovate to oblanceolate leaflets; flowers in long terminal racemes.*

B. leucophæa, Nutt. Low and spreading, 1° high, soft-hairy; bracts and stipules persistent, large and leaf-like; racemes reclined, one-sided; flowers on slender pedicels, cream-colored, large (1′ long); pods hoary, ovate. Open woods, W and S.

B. leucántha, Torr. & Gray. Smooth and glaucous, stout, 3°–5° high; branches spreading; petioles rather short; lanceolate stipules and bracts deciduous; racemes erect, long; flowers large (1′ long); pods oval-oblong, 2′ long, raised on a stalk fully twice the length of the calyx. Alluvial soil, from Ont. W. and S.

B. álba, R. Br. Smooth, 2°–3° high; branches slender, widely spreading; petioles slender; stipules and bracts minute, deciduous; racemes loose, erect, or spreading, long-peduncled; flowers small ($\frac{1}{2}$′–$\frac{3}{4}$′ long); pods cylindrical. S. Ind. and Mo. to La. and E.

** * * * Flowers indigo-blue; leaves of 3 leaflets, as in the foregoing.*

B. austràlis, R. Br. Smooth and stout, pale, erect, 2°–5° high; lanceolate and rather persistent stipules as long as the short petiole; racemes erect; flowers nearly 1′ long, on short pedicels; pods oval-oblong, 2′–3′ long, on a stalk as long as the calyx. Pa. to Ga. and W. to Mo.; also cult.

3. THERMÓPSIS. (Greek: *resembling the Lupine.*) 2l

** Stipules prominently shorter than the long petioles; pod sessile.*

T. Caroliniàna, Curtis. Stem smooth, 3°–6° high, simple; leaflets obovate-oblong, silky beneath; stipules ovate or oblong, clasping; racemes 6′–12′ long, villous, erect, many-flowered; pods oblong-linear, erect. Mts. of N. C.; and cult.

** * Stipules nearly equaling or longer than the short petioles; pod stalked.*

T. móllis, Curtis. Downy, 1°–2° high; branches spreading; leaflets 3 obovate-oblong; stipules oblong-ovate, leaflike, some as long as the petioles; long, narrow-linear, spreading pods; flowers spring. Open woods from S. Va., S.

4. CLADRÁSTIS, YELLOWWOOD. (Greek: *branches brittle.*)

C. tinctòria, Raf. Wood light yellow; bark close, like that of Beech; leaves of 7–11 parallel-veined oval or ovate leaflets (3′–4′ long and smooth,

as is the whole plant); panicles terminating the branchlets of the season, ample hanging (1° or more long); flowers delicately fragrant, cream-white. May to June. Much planted. Still often known in gardens as VIRGÍLIA LÙTEA.

5. SOPHÒRA. (An ancient name of an allied plant.)

S. Japónica, Linn. JAPAN S. Tree 20°–50° high; bark greenish; leaflets 11–13, oval or oblong acute, smooth; panicles loose, terminating the branches at the end of summer; flowers cream-white; fruit a string of fleshy, 1-seeded joints. China.

6. CROTALÀRIA, RATTLEBOX. (Greek: *a rattle*, the seeds rattling in the inflated pod.) Native, in sandy soil; flowers yellow, in summer.

C. sagittàlis, Linn. Low, 3′–6′ high, branching, beset with rusty-colored spreading hairs; leaves nearly sessile, oval or lance-oblong; peduncles 2–3-flowered. ① N. and S.

C. ovàlis, Pursh. Spreading, rough with appressed hairs; leaves short-petioled, oval, oblong, or lanceolate, hairy; peduncle with 3–6 scattered flowers. 2[1] S.

C. Púrshii, DC. Stems erect, rough-hairy; leaves smooth above, oblong or linear; racemes 6′–12′ long, 5–10-flowered. S. 2[1]

7. GENÍSTA, WOAD-WAXEN, WHIN. (Celtic: *little bush.*)

G. tinctòria, Linn. DYER'S W. or GREENWEED. Low and undershrubby, not thorny; leaves lanceolate; flowers bright yellow, rather small, somewhat racemed at the end of the striate-angled green branches, in early summer. Nat. from Eu. in sterile soil, N. Y. and Mass.

8. ÙLEX, FURZE, GORSE, WHIN. (An old Latin name.) Cult.

U. Europæus, Linn. 2°–5° high; spines 1′–2′ long; bracts large, ovate; calyx yellow, with black, spreading hairs, its teeth minute; flowers odorous. Eu.

U. nànus, Smith. DWARF F. 1°–3° high; spines shorter; bracts minute; calyx with appressed hairs, its teeth lanceolate. W. Eu.

9. CÝTISUS. (Ancient Roman name of some plant.)

* *Hardy shrubs.*

C. scopàrius, Link. SCOTCH BROOM. 3°–5° high, smooth, with long and tough, erect, angled, and green branches; leaves small, the lower short-petioled and with leaflets 3, obovate, or the upper of a single sessile leaflet, and large and showy golden-yellow flowers on slender pedicels in the axils; calyx with 2 short and broad lips; style and stamens slender, held in the keel, but disengaged and suddenly starting upward when touched (as when bees alight on the deflexed keel), the style coiling spirally; pod hairy on the edges. Barely hardy N.; running wild in Va. and S.; flowers early summer. Eu.

C. capitàtus, Jacq. 2°–4° high; branches erect-spreading, strict, rough-hairy; leaves villous; flowers yellow, numerous, crowded in terminal headlike umbels. Eu.

* * *Greenhouse shrubs.*

C. Canariénsis, Steud. A shrub with crowded, slender, soft-hairy leaves and leaflets 3, very small, obovate; flowers small, yellow, sweet-scented, in elongated racemes in late winter. Canary Islands, cult. in conservatories.

C. racemòsus, Hort. From Teneriffe; has flowers more spicate, and oblong-spatulate leaflets 3–4 times larger than the last.

10. LABÚRNUM. (Ancient Latin name.)

L. vulgàre, Gris. LABURNUM, GOLDEN CHAIN, or BEAN TREE. A low tree with smooth green bark; leaves slender-petioled; leaflets 3, oblong (2′–3′ long), pubescent beneath; flowers showy, golden-yellow, hanging in long racemes, in late spring; pods hairy, with one thicker edge, but not winged. Eu. Several cult. forms.

11. LUPÌNUS, LUPINE. (Latin: *lupus*, a wolf, because Lupines were thought to devour the fertility of the soil.)

* *Perennials.*

L. perénnis, Linn. WILD L. Somewhat hairy; stem erect, 1°–1½° high; leaflets 7–11, spatulate oblong or oblanceolate, green; raceme long; flowers of showy purplish blue (rarely pale), in late spring. N. Eng. to Minn. and S.

L. polyphýllus, Lindl. MANY-LEAVED L. 3°–4° high, rather hairy; leaflets 13–15, lanceolate or oblanceolate; raceme very long, dense; flowers blue, sometimes purple, variegated, or even white, in June. Ore. and Cal.; the principal hardy perennial species of the gardens.

* * *Annuals, or cult. as annuals.*

+– *Ovules only* 2; *leaflets usually* 9.

L. microcárpus, Sims. 1°–2° high, sparsely hairy; flowers yellow to (rarely) white or pink, forming distinct and separate whorls in the long raceme. Cal.

+– +– *Ovules* 4–8; *leaflets usually fewer* (5–9).

+– *Flowers normally blue; stems dwarf* (1° *or less*).

L. affìnis, Agardh. Short-hairy; leaflets 5–7, rather smooth above, broadly wedge-obovate, obtuse, or emarginate; bracts short; flowers whorled in the raceme, deep blue. Cal.

L. nànus, Dougl. DWARF L. Long-hairy; leaflets linear to oblanceolate, usually acute, pubescent both sides; bracts exceeding calyx; flowers bluish-purple. Cal.

+– +– *Flowers blue, white, or rose-color; stems tall* (2° *or more*).

L. mutábilis, Sweet. Cult. from S. Am.; tall, very smooth throughout; leaflets blunt, about 9, narrow-oblong; flowers very large, sweet-scented, violet-purple (or a white variety), with yellow and a little red on the standard.

L. hirsùtus, Linn. Cult. in old gardens, from Eu. Clothed with soft white hairs; leaflets spatulate-oblong; flowers in loose whorls in the raceme, blue, with rose-color and white varieties; pods very hairy.

+– +– +– *Flowers yellow.*

L. lùteus, Linn. YELLOW L., of the gardens, from Eu., silky-hairy, rather low; flowers in whorls, crowded in a dense spike.

12. MELILÒTUS, MELILOT, SWEET CLOVER. (Greek: *honey*, *Lotus*.) Foliage sweet-scented, especially in drying. Natives of the Old World, running wild in waste or cultivated ground; flowers all summer. ① ②

M. álba, Lam. WHITE M., BOKHARA or TREE CLOVER. 3°–6° high, branching; leaflets obovate or oblong, truncately notched at the end; white flowers in loose racemes. Has been cult. for green fodder, and now as a "bee plant."

M. officinàlis, Willd. YELLOW M. 2°–3° high, with merely blunt leaflets and yellow flowers.

13. MEDICÀGO, MEDICK. (The name of Lucerne, because it came to the Greeks from *Media*.) All natives of the Old World; a few have run wild here. Flowers all summer.

* *Flowers violet-purple or bluish.* 2

M. satìva, Linn. LUCERNE, ALFALFA. Cultivated for green fodder, especially S.; stems erect, 1°–2° high, from a long, deep root; leaflets obovate-oblong; racemes oblong; pod several-seeded, linear, coiled about 2 turns.

* * *Flowers yellow.* ① ②

M. lupulìna, Linn. BLACK MEDICK, NONESUCH. Low, spreading, downy, with wedge-obovate leaflets, roundish or at length oblong heads or spikes of small flowers, and little kidney-shaped, 1-seeded pods turning black when ripe. Waste places.

M. maculàta, Willd. SPOTTED M. Spreading or trailing; somewhat pubescent leaflets, broadly inversely heart-shaped, marked with a dark spot; peduncles 3–5-flowered; pod flat, compactly coiled three or more turns, its thickish edge beset with a double row of curved prickles. Waste places, N. Eng.

M. denticulàta, Willd. Like the last, but nearly glabrous; pod loosely coiled, deeply reticulated, with a sharp edge. Same range.

14. TRIFÒLIUM, CLOVER, TREFOIL. (Latin name: *three leaflets*.)

* *Flowers sessile in dense heads; corolla tubular, withering away after flowering.*

← *Calyx-teeth silky-plumose, longer than whitish corolla.* ①

T. arvénse, Linn. RABBIT FOOT or STONE C. Erect, 5′–10′ high, silk-downy, especially the oblong or at length cylindrical grayish heads or spikes; leaflets narrow. Eu.

← ← *Calyx scarcely hairy except a bearded ring in throat; shorter than rose-purple, long-tubular corolla; flowers sweet-scented, in summer.* 2

T. praténse, Linn. RED C. Stems ascending; leaflets obovate or oval, often notched at the end and with a pale spot on the face; head closely surrounded by the uppermost leaves. Eu. Extensively cult. in meadows.

T. mèdium, Linn. ZIGZAG C., MAMMOTH C. Like the last, but stem zigzag; leaves oblong, entire, spotless; head usually stalked. Eu. Dry hills, Nova Scotia to E. Mass.

* * *Flowers short-pediceled (reflexed when old), persistent and turning brownish in round umbels or heads, on slender naked peduncles; corolla white, rose-color or red.*

T. reflexum, Linn. BUFFALO C. Wild S. and especially W.; somewhat downy; stems ascending, 6′–12′ high; leaflets obovate-oblong, finely toothed; heads and rose-red and whitish flowers fully as large as in Red Clover; calyx-teeth hairy; pods 3–5-seeded. ① ②

T. stoloníferum, Muhl. RUNNING BUFFALO C. Smooth; some of the stems forming long runners; leaflets broadly obovate or obcordate; flowers white, barely tinged with purple; pods 2-seeded. 2 Prairies and oak-openings, W.

T. Carolinià̀num, Michx. CAROLINA C. Fields and pastures S.; a little downy, spreading in tufts 5′–10′ high; leaflets small; stipules broad; heads small; corolla purplish, hardly longer than the lanceolate calyx-teeth. 2

T. rè̀pens, Linn. WHITE C. Smooth; stems creeping; leaflets obcordate; petioles and peduncles long and slender; stipules narrow; heads loose, umbel-like; white corolla much longer than the slender calyx-teeth. Fields, etc., everywhere. 2 This is the SHAMROCK of Ireland.

T. hȳ́bridum, Linn. ALSIKE C. Like the last, but the taller stems erect or ascending, not rooting at nodes; flowers rose-tinged. Becoming common. Eu. 2

T. incarnà̀tum, Linn. CRIMSON C. Hairy, stem erect, 1°–2° high; leaflets obovate or nearly round; stipules broad, with broad leafy tips; flowers crimson, scarlet, or (rarely) cream-color, ½′ long; heads stalked, terminal, ovoid, at length cylindric. Grown in Middle States and S. ①

* * * *Flowers short-pediceled (reflexed when old), in round heads, produced through late summer and autumn; corolla yellow, turning chestnut-brown, dry and papery with age.* ①

T. agrà̀rium, Linn. YELLOW C., HOP C. Smoothish, 6′–12′ high; leaflets obovate-oblong, all nearly sessile on the end of the petiole; stipules narrow, cohering with petiole half its length. Eu. Eastward.

T. procúmbens, Linn. LOW HOP C. 3′–6′ high, spreading, rather downy; leaflets wedge-obovate, notched at the end, the lateral at a little distance from the other; stipules ovate, short. Eu. Common.

15. PETALOSTÈMON, PRAIRIE CLOVER. (Greek: *petal, stamen.*) In prairies, pine barrens, etc. W. and S.; flowers never yellow, in terminal spikes; summer. 2

* *Leaflets* 5–9; *spikes long-peduncled.*

P. violà̀ceus, Michx. Smoothish, 1°–2° high; leaflets mostly 5, narrow-linear; spikes globose-ovate, oblong-cylindric with age; flowers rose-purple; calyx silky, hoary. Prairies W.

P. cándidus, Michx. Smooth, 2°–3° high; leaflets 7–9, lanceolate or linear-oblong; spikes oblong, cylindric with age; bracts awl-pointed. Prairies W.

* * *Leaflets* 13–29; *spikes short peduncled.*

P. villò̀sus, Nutt. Soft, downy, or silky all over; leaflets 13–17, linear or oblong; spikes cylindric; corolla rose-color. Wis. and W.

P. foliò̀sus, Gray. Smooth; leaflets 15–29, linear-oblong; spikes cylindric; corolla rose-color. Ill., Tenn.

16. DÀLEA. (For an English botanist, *Samuel Dale.*)

D. alopecuroìdes, Willd. Stem erect, 1°–2° high; leaves smooth, of many linear-oblong leaflets; flowers whitish, small, in a dense silky spike in summer. ① Alluvial soil, Ala., far N. W.

17. AMÓRPHA, FALSE INDIGO. (Greek: *wanting form,* from the absence of 4 of the petals.) Leaflets usually with little stipels. Flowers summer.

* *Pods* 1-*seeded; leaflets small.*

A. canéscens, Nutt. LEAD PLANT. 1°–3° high, hoary with soft down; leaves sessile, of 29–51 elliptical leaflets, smoothish above when old; flowers violet-purple in late summer. Prairies and rocky banks, W. and S. W.

A. herbàcea, Walt. In pine barrens, N. C. to Fla. and W., is pubescent or glabrous, with 15–35 rigid, oblong, dotted leaflets, and spicate, solitary, or panicled racemes of blue or white flowers; shrub 2°–4°, with purple branches.

* * *Pods 2-seeded; leaflets larger, scattered.*

A. fruticòsa, Linn. False Indigo. A tall or middle-sized shrub, smoothish; leaves petioled, of 15–25 oval or oblong leaflets; flowers violet or purple in early summer. River banks, Penn. S. and W.; also cult.

18. PSORÀLEA. (Greek: *scurfy*, from the roughish dots or glands.) Flowers early summer, violet, bluish, or almost white. 2*l*

* *Leaves pinnately 3-foliolate, or the uppermost of a single leaflet.*

P. Onóbrychis, Nutt. 3°–5° high, erect, nearly smooth; leaflets lance-ovate, taper-pointed; stipules and bracts awl-shaped; flowers in short peduncled racemes 3′–6′ long; pods rough and wrinkled. River banks, O. to Ill., S. and E.

P. melilotoìdes, Michx. Dry places, W. and S. 1°–2° high, erect, somewhat pubescent, slender; leaflets lanceolate or lance-oblong; stipules awl-shaped; flowers in oblong spikes, long-peduncled; pods strongly wrinkled.

* * *Leaves palmately 3–5-foliolate; root not tuberous.*

P. tenuiflòra, Pursh. Bushy-branched, slender, 2°–4° high, somewhat hoary when young; leaflets linear or obovate-oblong, much dotted; flowers (2″–3″ long) in loose racemes; pods glandular-roughened. Prairies, Ill., W.

P. argophýlla, Pursh. Widely branched, 1°–3° high, silvery white all over with silky hairs; leaflets elliptic-lanceolate; spikes interrupted. Prairies, Wis., W.

* * * *Leaves palmately 5-foliolate; root tuberous.*

P. esculénta, Pursh. Pommé Blanche. Low and stout, 5′–15′ high, roughish hairy; root turnip-shaped, mealy, edible; leaflets 5, lance-oblong or obovate; spike dense, oblong; flowers ½′ long; pod hairy, pointed.

19. TEPHRÒSIA, HOARY PEA. (Greek: *hoary.*) Native plants of dry, sandy, or barren soil, chiefly S.; flowers summer.

* *Stems erect, simple, very leafy up to the terminal, oblong, dense, raceme or panicle.*

T. Virginiàna, Pers. Goat's Rue, Catgut, from the very tough, long and slender roots. White, silky-downy; stem erect, simple, 1°–2° high; leaflets 17–29 linear-oblong; flowers large and numerous, yellowish-white with purple; pods downy. Common N. and S.

* * *Stems branching, often spreading or decumbent; leaves scattered; racemes opposite the leaves, long-peduncled; flowers fewer and smaller; pubescence mostly yellowish or rusty.*

T. spicàta, Torr. & Gray. 1°–2° high, loosely soft-hairy; leaflets 9–15, wedge-oblong or obovate; flowers 6–10, rather large, scattered, white and purple, in a raceme or spike. Del. S.

T. hispídula, Pers. Low, closely pubescent or smoothish; leaflets 11–15, oblong, small, the lowest pair above the base of the petiole; flowers 2–4, small, reddish-purple. Va. S.

T. chrysophýlla, Pursh. Nearly prostrate; leaflets 5–7, wedge-obovate, smooth above and yellowish silky beneath, the lowest pair close to the stem; flowers as in the last. Ga. S. and W.

20. SESBÁNIA. (Arabic: *Sesban*, a little altered.) Flowers late summer.

S. macrocárpa, Muhl. Tall, smooth; leaflets linear-oblong; flowers few, on a peduncle shorter than the leaves, corolla yellow with some reddish or purple; pods linear, narrow, hanging, 8′–12′ long; seeds many. ⓘ Swamps S.

S. vesicària, Ell. Resembles the preceding in foliage and small, yellow flowers, but has a broadly oblong turgid pod, only 1′ or 2′ long, pointed, raised above the calyx on a slender stalk, 2-seeded, the seeds remaining inclosed in the bladdery white lining of the pod when the outer valves have fallen. ⓘ Low grounds S.

S. grandiflòra, Poir. A shrub or tree-like plant of India, run wild in Florida, occasionally cult. for ornament S.; flowers 3′–4′ long, white or red; pods slender, hanging, 1° or so long.

21. INDIGÓFERA, INDIGO PLANT. (Name means *producer of indigo.*)

I. tinctòria, Linn. This and the next furnish much of the indigo of commerce, were cult. for that purpose S., and have run wild in waste places; woody at base, with 7–15 oval leaflets, racemes shorter than the leaves, the deflexed knobby terete pods curved and several-seeded.

I. Ànil, Linn. Differs mainly in its flattish and even pods thickened at both edges.

22. ONÓBRYCHIS, SAINFOIN. (Greek: *asses' food.*)

O. satìva, Lam. Common S. Sparingly cult. from Europe as a fodder plant; herb 1°–2° high; leaflets numerous, oblong, small; stipules brown, thin, pointed; spikes of light pink flowers on long axillary peduncles, in summer; pod semicircular bordered with short prickles or teeth. 2ℓ

23. ASTRÁGALUS, MILK VETCH. (Greek: application uncertain.) Very many native species west of the Mississippi. 2ℓ

* *Pod turgid, completely or partially 2-celled by the intrusion of the dorsal suture.*

+ *Pod plum-shaped, becoming thick and fleshy, indehiscent.*

A. caryocárpus, Ker. Ground Plums. Minutely appressed-pubescent; leaflets narrow, oblong; short racemes or spikes of violet-purple flowers in spring; fruit of the size and shape of a small plum, but more or less pointed, fleshy, becoming dry and corky, very thick-walled. Common along the Upper Mississippi and W. and S. on the plains.

A. Mexicànus, DC. Smooth or with looser hairs; leaflets roundish or oblong; corolla cream-color, bluish only at tip; fruit globular, pointless. Prairies, Ill. to Kan. and S.

+ + *Pod dry, coriaceous, cartilaginous, or membranous, dehiscent.*

++ *Pod completely 2-celled.*

A. mollíssimus, Torr. Stout, decumbent, densely silky, villous throughout and tomentose; flowers violet; pod sulcate at both sutures. Neb. to Kan. and Tex. A "loco" weed.

A. Canadénsis, Linn. Tall, erect, 1°–4° high, slightly pubescent; flowers greenish cream-colored, in summer; pods oblong, terete, scarcely sulcate. River banks, common.

A. glàber, Michx. Pine barrens, N. C. to Fla.; tall, nearly smooth; leaflets 15–25, oblong-linear, pubescent beneath; spikes loose, longer than the leaves, with white flowers; pod oblong and curved, flattened edgewise.

\+\+ \+\+ *Pod not completely 2-celled.*

A. distórtus, Torr. & Gray. Low, diffuse, nearly smooth; leaflets oblong, emarginate; flowers pale purple; pod curved, thick-coriaceous. Ill. to Iowa and S. to Tex.

* * *Pod 1-celled, neither suture intrusive, or the ventral more than dorsal.*

A. Coòperi, Gray. Gravelly shores N. and W.; resembles the foregoing, but smoother; 1°–2° high, with small white flowers in a short spike, and inflated ovoid pods about 1′ long, thin-walled, and not divided internally; flowers in early summer.

24. ROBÍNIA, LOCUST TREE. (For two early French botanists, *Robin.*) Natives of Atlantic, Middle, and Southern States, planted, and the common Locust running wild N. Flowers late spring and early summer.

R. Pseudacàcia, Linn. Common L. or False Acacia. Tree; branchlets naked; racemes slender and loose-hanging; flowers fragrant, white; pods smooth. Used as a stock for next two.

R. viscòsa, Vent. Clammy L. Small tree; branches and stalks clammy; prickles very short; racemes short and dense; flowers faintly rose-colored; scentless pods rough, clammy. Very rare wild.

R. híspida, Linn. Bristly L. or Rose Acacia. Ornamental shrub; branches and stalks bristly; broad leaflets tipped with a long bristle; flowers large and showy, bright rose-colored in close or loose racemes; pods clammy-bristly.

25. CARAGÀNA, PEA TREE. (Tartar name.) Planted for ornament.

* *Petioles with unarmed tip.*

C. arboréscens, Lam. Siberian P. Shrub or low tree; leaflets 4–6 pairs, oval-oblong, downy; stipules firm or spinescent; flowers 2 or 3 together, yellow, in spring; pod cylindric. Siberia.

C. microphýlla, Lam. Low shrub; leaflets 6–9 pairs, 4–5 lines long; stipules thorny; flowers solitary or in pairs; pod small, compressed. Asia.

* * *Petioles with spiny tips.*

C. Chamlàgu, Lam. Chinese P. A low or spreading shrub; has 2 rather distant pairs of smooth, oval, or obovate leaflets; stipules spiny. China and Japan.

C. frutéscens, DC. Low shrub; leaflets 2 pairs, obovate, crowded at the summit of the petiole; stipules soft. Siberia to Japan.

26. COLÙTEA, BLADDER SENNA. (Derivation obscure.)

C. arboréscens, Linn. Common B. Leaflets 7–11, oval and rather truncate; racemes of 5–10 yellow flowers, in summer; pods large, very thin-walled, closed. Eu.

27. WISTÀRIA. (For *Prof. Wistar* of Phila.) Very ornamental woody twiners; flowers spring.

W. frutéscens, Poir. American W. Soft-downy when young; leaflets 9–15, lance-ovate; raceme of showy blue-purple flowers, dense; calyx narrowish, wings with one short and one very long appendage at the base of the blade; ovary smooth. Along streams W. and S., and cult.

W. Chinénsis, DC. Chinese W. A very fast-growing climber (sometimes 20° in a season); racemes long, pendant; wings appendaged on one side

only. Flowers blue. Often flowering twice in the season. There are white and double-flowered and variegated-leaved varieties and some with racemes 2°–3° long. Barely hardy in New England. China or Japan.

28. STYLOSÁNTHES. (Greek: *column, flower*, from the stalk-like calyx-tube.)

S. elàtior, Swartz. Low, inconspicuous, tufted herb; stems wiry, downy on one side; leaflets lanceolate, strongly straight-veined; flowers orange-yellow, small, in little clusters or heads, in late summer. Pine barrens from L. I. to Fla. and Ind., S. W.

29. LESPEDÈZA, BUSH CLOVER. (For *Lespedez*, a Spanish governor of Florida.) Mostly homely plants in sandy or sterile soil; flowers late summer and autumn.

* *Stipules and bracts minute; natives (except one).* 2

+– *Flowers of two sorts, the larger violet-purple, scattered or in open panicles or clusters, slender-peduncled, seldom fruitful; the fertile ones mostly without petals, intermixed or in small sessile clusters; pod generally exserted.*

L. procúmbens, Michx. Slender or trailing, minutely hairy or soft-downy; leaflets oval or oblong; peduncles slender and few-flowered. Common.

L. violàcea, Pers. Bushy-branching, erect or spreading, sparsely leafy; leaflets thin, broadly oval or oblong, finely appressed-pubescent beneath; peduncles slender, loosely few-flowered. Common.

L. reticulàta, Pers. Erect, densely leafy; leaflets thickish, linear to linear-oblong; flowers clustered on peduncles, much shorter than the leaves; pods acute. Mass. to Minn. and S.

L. Stùvei, Nutt. Stems upright-spreading, very leafy, downy with spreading hairs; leaflets mostly oval or roundish, silky or white-woolly beneath; pods acuminate. Mass. to Mich. and S.

L. Sieb̀ldi, Miq. (or DESMÒDIUM PENDULIFLÒRUM). A recent Japanese garden plant, is a shrub-like herb 3°–6°, with lanceolate, pointed leaflets, smooth above and appressed-pubescent beneath, and axillary racemes, 3′–6′ long, of late rose-purple flowers about a half inch in length. Known also as L. BÍCOLOR, but that species is probably not cult. in this country.

+– +– *Flowers all alike, perfect, in close spikes or heads, on upright, (2°–4° high) simple, rigid stems; corolla cream-color or white with a purple spot on the standard, about the length of the silky-downy calyx; pod included.*

L. polystàchya, Michx. Leaflets roundish or oblong-ovate; petioles and peduncles slender; spikes becoming rather long and loose; mature pod hardly shorter than calyx. Common.

L. capitàta, Michx. Stems rigid, woolly; leaflets oblong or sometimes linear, silky beneath, thickish; peduncles and petioles short; flowers in globular heads; pod much shorter than the calyx. Common.

L. angustifòlia, Ell. Like the last, but leaflets linear, heads oblong on slender peduncles; pod hardly shorter than calyx. N. J., S. and W.

* * *Stipules and bracts broad and scarious; naturalized from China and Japan.* ①

L. striàta, Hook. & Arn. JAPAN CLOVER. Low and spreading, 3′–10′ high, much branched, almost smooth; leaflets oblong or wedge-oblong, ¼′–½′ long; peduncles very short, with 1–5 small, purplish flowers. A forage plant in the S. States and Cal.

30. DESMÒDIUM, TICK TREFOIL. (Greek: a *band* or *chain*, from the connected joints of the pod.) ♃ Flowers in summer.

§ 1. *Native hardy species; the joints of the pod adhere to clothing or to the coats of animals; flowers sometimes turning greenish in withering.*

* *Pod raised far above the calyx on a slender stalk, straightish on the upper margin, divided from below into* 1–4 *joints; flowers in one naked terminal raceme or panicle; plants smooth,* 1°–3° *high; stipules bristle-form.*

D. nudiflòrum, DC. The mostly leafless flower-stalk and the leaf-bearing stem rising separately from a common root; the leaves all crowded on the summit of the stem; leaflets broadly ovate, bluntish, pale beneath. Common.

D. acuminàtum, DC. Flower stalk terminating the stem, which bears a cluster of leaves; leaflets large (4′–5′ long), round-ovate, with a tapering point, or the end one blunter, green both sides. Common.

D. pauciflòrum, DC. Leaves scattered along the low, (8′–15′ high) ascending stems; leaflets rhombic-ovate, pale beneath; raceme terminal, few-flowered. Ont. to Penn., Kans. and S.

* * *Pod raised on a stalk little if at all surpassing the deeply-cleft calyx; stems long, prostrate or decumbent; racemes mostly simple, axillary and terminal; stipules ovate, striate, taper-pointed, persistent.*

D. rotundifòlium, DC. Soft-hairy; leaflets orbicular, about 3′ long; flowers purple, the 3–5 rhombic-oval joints of the pod rather large.

* * * *Pod little if at all stalked in the calyx; racemes panicled.*

+– *Stems erect,* 3°–6° *high; stipules large, ovate or lance-ovate, and pointed; bracts similar but deciduous; flowers large for the genus.*

+– +– *Pods of* 4–7 *rhombic-oblong joints, each joint about* ½′ *long.*

D. canéscens, DC. Hairy; stems branching; leaves pale; leaflets ovate, bluntish, about the length of the common petiole, reticulated beneath and both sides roughish with fine, close pubescence; joints of pod very adhesive. Common.

D. cuspidàtum, Torr. & Gray. Very smooth, except panicle; stem straight; leaflets lance-ovate, taper-pointed (3′–5′ long), longer than the common petiole; pod with smoothish joints. Common.

+– +– +– *Pods of* 3–5 *oval joints, not over* ¼′ *long.*

D. Illinoénse, Gray. Rough with short hairs; leaflets ovate-oblong or ovate-lanceolate (2′–4′ long), obtuse, firm, venation prominent, whitish beneath; pod scarcely over 1′ long.

+– +– *Stems erect,* 2°–6° *high; stipules mostly deciduous, awl-shaped, small, and inconspicuous; racemes panicled.*

+– *Bracts small and inconspicuous; common petiole slender; flowers smallish; joints of pod* 3–5, *unequal-sided.*

D. viridiflòrum, Beck. Stem very downy; leaflets broad ovate, very blunt, white, with soft-velvety down beneath. N. J. to Fla., Mo., and Tex.

D. Dillènii, Darl. Stem and the oblong or oblong-ovate, bluntish, thin leaflets softly and finely pubescent; the latter 2′–3′ long. Common.

D. paniculàtum, DC. Smooth, or nearly so, throughout; leaflets lanceolate or lance-oblong, tapering to a blunt point, 3′–5′ long; panicle loose. Common.

D. strictum, DC. Slender stems smooth below, above and the narrow panicle rough-glandular; leaflets linear, blunt, reticulated, very smooth, 1′–2′ long. N. J. to Fla. and La.

++ ++ *Bracts, before flowering, conspicuous; common petiole very short; joints of pod roundish.*

D. Canadense, DC. Stem hairy, 3°–6° high, leafy up to the panicle; leaflets lance-oblong, blunt, 2′–3′ long; racemes dense, the pink-purple flowers larger than in any other, ⅓′–½′ long. Chiefly N. and W.

D. sessilifolium, Torr. & Gray. Stem pubescent, 2°–4° high; the long panicle naked; common petiole hardly any; leaflets linear or linear-oblong, blunt, reticulated, rough above, downy beneath; flowers small. Chiefly westward.

+ + + *Stems ascending or spreading, 1°–3° long; stipules and bracts awl-shaped and deciduous; panicle naked, loose; flowers small; pod of 2 or 3 small, oval, or roundish joints.*

D. rigidum, DC. Stems hoary, with a rough pubescence; leaflets ovate-oblong, blunt, thickish, roughish, and reticulated, 1′–2½′ long, the lateral longer than the common petiole. Mass., S. and W.

D. Marilandicum, Boott. Smooth or nearly so, slender; leaflets ovate or roundish, thin, the lateral ones about the length of the slender petiole; otherwise like the preceding, and of like range.

+ + + + *Stems reclining or prostrate; racemes few-flowered.*

D. lineatum, DC. Smoothish; stem striate-angled; stipules awl-shaped, deciduous; leaflets orbicular, 1′ or less in length, much longer than the common petiole; flowers and 2 or 3 rounded joints of the pod small. Md. to Fla. and La.

§ 2. *Exotic conservatory species.*

D. gyrans, DC. Telegraph Plant. Leaflets elliptic-oblong, terminal very large, lateral very small. Cult. from India for curious movements of leaflets. (Lessons, Fig. 491.)

31. ERYTHRINA. (Greek: *red*, the usual color of the flowers.)

E. herbacea, Linn. Stems herbaceous, 2°–4° high from a thick, woody base, somewhat leafy, the leaflets broadly triangular-ovate; others nearly leafless, terminating in a long, erect raceme of narrow, scarlet flowers; standard (2′ long) straight, folded, lanceolate; keel small; seeds scarlet; flowers spring. Sandy soil near the coast S.

E. Crista-galli, Linn. Tree-like; leaflets oval or oblong; loose racemes of large crimson flowers; keel large; standard broad, spreading; wings rudimentary. Cult. in conservatories, from Brazil.

32. GLYCINE. (Greek: *sweet.*) ①

G. hispida, Maxim. (or Soja hispida). Soy Bean. Plant strong and erect, 2°–4° tall, loosely hairy; leaflets large and thin, broadly ovate and nearly or quite obtuse, the lateral ones lop-sided and short stipitate, the terminal long stipitate, the common petiole 6′–12′ long; pods flat and villous, 2′–4′ long, containing from 2–4 roundish or oblong small Beans, and splitting open when ripe. Coming into prominence as a forage plant, the Beans also edible. Japan and China; but unknown wild, and supposed to be derived from Glycine Soja.

33. ARACHIS, PEANUT, GOOBER. (Meaning of name obscure.)

A. hypogæa, Linn. The only common species, from South America, cult. S.; the nut-like pods familiar, the oily, fleshy seeds being roasted and much eaten. ①

34. ÆSCHYNÓMENE, SENSITIVE JOINT VETCH. (Greek: *ashamed*, referring to the sensitive leaflets of some species.) Flowers summer.

Æ. híspida, Willd. Stem rough-bristly, 2°–4° high; leaflets 37–51, linear; flowers yellow; pod bristly, stalked; joints 6–10. Low grounds, Penn. S. ①

35. CORONÍLLA. (Latin: *a little crown.*) Cult. from Eu. for ornament. 2

C. vària, Linn. PURPLE CORONILLA. Hardy herb, spreading from underground shoots, smooth, 2° high; leaves sessile; leaflets 15–21, obovate-oval or oblong, small; flowers pink-purple and white, all summer.

C. glaùca, Linn. YELLOW SWEET-SCENTED C. Greenhouse shrub; leaflets 5–9, glaucous, obovate, or obcordate, the terminal largest; flowers sweet-scented, yellow, the claws of the petals not lengthened.

36. RHYNCHÒSIA. (Greek: *beaked;* of no obvious application.) Chiefly southern; flowers summer. 2

* *Flowers in axillary racemes.*

+ *Calyx shorter than corolla, somewhat 2-lipped.*

R. mínima, DC. Along the coast from S. C., S.; tomentose; leaflets small and broad; racemes very slender, with 6–12 minute flowers.

+ + *Calyx nearly or quite as long as corolla, not lipped.*

R. tomentòsa, Hook & Arn. Trailing and twining, pubescent; leaflets 3, round or round-rhombic; racemes axillary, few flowered, almost sessile. Dry sandy soil, from Va. S.

R. erécta, DC. Erect, more or less tomentose; leaflets 3, oval to oblong; racemes short, on short peduncles. Del. S.

R. renifórmis, DC. Dwarf, erect, pubescent; leaflets solitary (rarely 3) round-reniform; racemes sessile. Va. S.

* * *Flowers axillary, solitary or in pairs; calyx shorter than corolla.*

R. galactoìdes, Endl. Bushy-branched, 2°–4° high, not twining, minutely pubescent; leaflets 3, small and rigid, oval, hardly any common petiole; standard reddish outside. Dry sand ridges, from Ala. S.

37. PHASÈOLUS, BEAN, KIDNEY BEAN. (The ancient name of the Kidney Bean.) Flowers summer and autumn. (Lessons, Figs. 28–30.)

* *Native species, small-flowered.*

P. perénnis, Walt. Stems slender, climbing high; leaflets roundish-ovate, short-pointed; racemes long end loose, often panicled; flowers small, purple; pods drooping, scimitar-shaped, few-seeded. 2 New Eng. W. and S.

* * *Exotic species, cultivated mainly for food, all with ovate, pointed leaflets.* ①

P. vulgàris, Linn. KIDNEY BEAN, STRING BEAN, POLE BEAN. Twining; racemes of white or sometimes dull purplish or variegated flowers shorter than the leaf; pods linear, straight; seeds tumid. Many varieties, ranging from BUSH BEANS to climbers, and presenting many forms and colors of seeds. Probably from tropical America.

P. lunàtus, Linn. LIMA BEAN, SIEVA OR CAROLINA B., etc. Twining; racemes of small, greenish-white flowers shorter than the leaf; pods broad

and curved to scimitar-shaped; seeds few, large, and flat. Like the preceding, this runs into many forms, amongst them the Bush or Dwarf Limas. S. Amer.

P. multiflòrus, Willd. Spanish Bean, Scarlet Runner when red-flowered; twining high; flowers showy, bright scarlet, or white, or mixed, in peduncled racemes surpassing the leaves; pods broadly linear, straight or a little curved; seeds large, tumid, white or colored. Tropical America.

38. VÍGNA. (For *Dominic Vigni*, commentator of Theophrastus at Padua in the 17th century.)

V. Sinénsis, Hassk. China Bean, Black-eyed Bean, Black Pea, Cowpea. With long peduncles bearing only 2 or 3 (white or pale) flowers at the end; the beans (which are good) white or dark with a black circle round the scar; is widely grown in the S. for forage. ① China and Japan.

V. luteola, Benth. Wild from S. C. to Fla. and W., is hirsute, with ovate or lance-ovate leaflets; yellow flowers on stout peduncles longer than the leaves, and hairy pod.

39. DÓLICHOS, BLACK BEAN, etc. (Greek: name of a Bean, meaning *elongated*, perhaps from the tall-climbing stems.)

D. Lâblab, Linn. Egyptian or Black Bean. Smooth twiner; racemes elongated; flowers showy, violet, purple, or white, 1′ long; pods thick, broadly oblong, pointed; seeds black or tawny with a white scar. ① India.

40. STROPHOSTÝLES. (Greek: *turning, style.*)

S. angulòsa, Ell. Spreading on the ground; ovate entire or commonly 3-lobed or angled leaflets; peduncles twice the length of the leaves; flowers purplish, or at length greenish; seeds oblong, 3″ long; pod 2′–3′ long by 3″ wide. Sandy shores and river banks. ①

S. pedunculàris, Ell. More slender than the preceding, sometimes twining a little; leaflets ovate or oblong-linear, entire, rarely at all lobed; peduncles several times surpassing the leaves; flowers pale purple; seeds 1½″–2″ long; pod 1½′–2′ long, scarcely 2″ wide. Sandy soil, from L. I. and S. Ind., S. 2

S. pauciflòrus, Wats. Spreading or low-climbing, slender, pubescent; leaflets small, oblong-lanceolate or linear; flowers few and small, purplish, on a short peduncle; pod straight, flat, only 1′ long. River banks W. and S. ①

41. CENTROSÈMA, SPURRED BUTTERFLY PEA. (Greek: *spur, standard.*) 2

C. Virginiànum, Benth. Trailing and low twining; slender, roughish with minute hairs; leaflets ovate-oblong to linear, very veiny, shining; peduncles 1–4-flowered, shorter than the leaves; flowers showy, violet-purple, 1′ long, in summer. Sandy woods, chiefly S.

42. CLITÒRIA, BUTTERFLY PEA. (Derivation recondite.) 2

C. Mariàna, Linn. Smooth; stem erect or slightly twining (1°–3° high); leaflets obovate-oblong, pale beneath; flowers very showy, light blue, 2′ long, 1–3 on short peduncles; pod straight, few-seeded; flowers summer. Dry ground, N. J., S., and W. to Mo. and Tex.

43. KENNÉDYA. (For an English florist.) Australian plants, of choice cultivation in conservatories. ♃

K. rubicúnda, Vent., is hairy, free-climbing, with 3 ovate leaflets; ovate-lanceolate stipules; about 3-flowered peduncles, the dark red or crimson flowers over 1′ long.

K. prostràta, R. Br., has 1- or 2-flowered peduncles, obovate or oblong leaflets and cordate stipules. The Var. *Marryáttæ*, has 4-flowered peduncles.

44. GALÁCTIA, MILK PEA. (Greek: *milky*, which these plants are not.) Flowers summer. ♃

G. glabélla, Michx. Prostrate, nearly smooth; leaflets rather rigid, ovate-oblong, shining above; flowers rose-purple 4–8 on a peduncle not exceeding the leaves; pod somewhat hairy. Sandy soil, from N. Y. S.

G. pilòsa, Ell. Spreading, somewhat twining, soft-downy and hoary, even to the 8–10-seeded pod; racemes long-peduncled, many-flowered; leaflets oval. Sandy barrens, from Penn. S.

G. Elliótii, Nutt. Near the coast, S. Car. to Fla.; leaves pinnate, of 7–9 oblong, emarginate leaflets; racemes longer than the leaves, bearing few white red-tinged flowers; pod falcate and hairy, 3–5-seeded.

45. AMPHICARPÆA, HOG PEANUT. (Greek: *double-fruited*, alluding to the two kinds of pods.) ♃ Twiners.

A. monòica, Nutt. Slender, much-branched; stems brownish-hairy; leaflets 3, thin rhombic-ovate, ½′–2′ long; racemes drooping; calyx of upper flowers, 2″ long; ovary glabrous, except margin; subterranean pods, turgid, hairy; flower late summer and autumn. Common.

A. Pitcheri, Torr. & Gray. Like the preceding; but leaflets 2′–4′ long; calyx 3″ long, teeth acuminate; ovary hairy; subterranean fruit rare. W. N. Y. to Ill., Mo., La., and Tex.

46. ÁPIOS, GROUNDNUT, WILD BEAN. (Greek: *pear*, from the shape of the tubers.) ♃

A. tuberòsa, Moench. Underground shoots bearing strings of edible tubers 1′–2′ long; stems slender, rather hairy; leaflets ovate-lanceolate. Low grounds.

47. PÌSUM, PEA. (The old Greek and Latin name of the Pea.) ⓘ (Lessons, Figs. 34, 35.)

P. satìvum, Linn. COMMON PEA. Smooth and glaucous; stipules very large, leafy; leaflets commonly 2 pairs; tendrils branching; peduncles with 2 or more large flowers; corolla white, bluish, purple, or parti-colored; pods rather fleshy. Cult. from the Old World.

48. LÁTHYRUS, VETCHLING. (Old Greek name.) Flowers summer.

* *Stem and petioles wing-margined; leaflets one pair; cult. from Eu. for ornament.*

L. odoràtus, Linn. SWEET PEA. Stem roughish-hairy; leaflets oval or oblong; flowers 2 or 3 on a long peduncle, sweet-scented, white, with the standard rose-color, or purple, with various varieties. ⓘ (Lessons, Fig. 393.)

***L. latifòlius*, Linn.** Everlasting Pea, Perennial Pea. Smooth, climbing high; stems broadly winged; leaflets oval, with parallel veins very conspicuous beneath; flowers numerous in a long-peduncled raceme, pink-purple; also a white variety; scentless. 2

* * *Stems wingless or merely margined; leaflets 2–8 pairs; native.* 2

+ *Stipules large and broad.*

L. marítimus, Bigel. Beach Pea. 1° high, leafy, smooth; stipules broadly ovate, hastate; leaflets oval, crowded; peduncle bearing 6–10 rather large purple flowers. Sea-shore N. J. N., and on the Great Lakes.

L. ochroleùcus, Hook. Stems slender, 1°–3° high; leaflets glaucous, thin, ovate, or oval, twice larger than the semi-cordate stipules; peduncles with 7–10 rather small yellowish-white flowers. Hillsides and banks N. and W.

+ + *Stipules narrow, semi-sagittate, acuminate.*

L. venòsus, Muhl. Climbing; leaflets 8–12, scattered, ovate, or oblong, often downy beneath; peduncles bearing many purple flowers. Shady banks W. and S.

L. palústris, Linn. Slender, 1°–2° high; stems margined or slightly winged; leaflets 4–8, linear to oblong; peduncles with 2–6 rather small purple flowers. Wet grounds N. and W.

Var. **myrtifòlius**, Gray. Climbing 2°–4° high; leaflets oblong or oval; upper stipules larger and more leaf-like; flowers paler. Same range, and S. to N. C.

49. VÍCIA, VETCH, TARE. (The old Latin name of the genus.)

* *Flowers several or many, on a slender peduncle, in spring or summer; pod several-seeded; wild species in low ground, 1°–4° high.* 2

+ *Peduncle 4–8-flowered; plant smooth.*

V. Americàna, Muhl. Leaflets 10–14, oblong, very blunt, veiny; flowers purplish, over ½′ long. Common N. and W.

+ + *Peduncle bearing very many small, soon reflexed flowers.*

V. Caroliniàna, Walt. Smoothish; leaflets 8–24, oblong, blunt; flowers small, white, or purplish-tipped, rather loose in the slender raceme. Can. to Ga. and W.

V. Crácca, Linn. Rather downy; leaflets 20–24, lance-oblong, mucronate-pointed; spike dense; flowers blue (nearly ½′ long), turning purple. Only N. and W.

* * *Flowers 1–5 on a slender peduncle, in summer or spring, very small; leaflets oblong-linear, 4–8 pairs; pod oblong, only 2–4-seeded; slender and delicate European annuals in fields and waste places, N. E. coast.*

***V. tetraspérma*, Linn.** Leaflets blunt; corolla whitish; pod 4-seeded, smooth.

***V. hirsûta*, Koch.** Leaflets truncate; corolla bluish; pod 2-seeded, hairy.

* * * *Flowers 1–2, sessile, or on peduncles shorter than leaves, pretty large; pod several-seeded; stem simple, low, not climbing.* ①

***V. sativa*, Linn.** Common Vetch or Tare. Somewhat hairy; leaflets 10–14, oblong or obovate to linear, apex notched and mucronate; flowers mostly in pairs and sessile, violet-purple; seeds tumid. Eu. Nat. N. Cult. for stock.

V. micrántha, Nutt. Smooth; leaflets linear, obtuse, 4–6; flowers minute, pale blue; seeds black. N. Ala., W.

50. LENS, LENTIL. (Classical Latin name. The shape of the seed gave the name to the glass lens for magnifying.) ①

L. esculénta, Moench. COMMON LENTIL of Europe, cult. for fodder and for the seeds, but rarely with us; slender plant, barely 1° high, resembling a Vetch, with several pairs of oblong leaflets (½′ long), 2 or 3 small, white, or purplish flowers on a slender peduncle, and a small broad pod, containing 2 orbicular sharp-edged (lens-shaped) seeds.

51. CÌCER, CHICK-PEA. (An old Latin name for the Vetch.) ①

C. arietînum, Linn. COMMON C. of the Old World, called COFFEE PEA at the West, there cult. for its seeds, which are used for coffee; their shape gave the specific name, being likened to the head of a sheep; plant 9′–20′ high, covered with soft, glandular, acid hairs; leaves of 8–12 wedge-obovate serrate leaflets; peduncle bearing 1 small whitish flower, succeeded by the turgid small pod.

52. CÉRCIS, REDBUD, JUDAS TREE. (Ancient name of the Judas tree.)

C. Canadénsis, Linn. AMERICAN REDBUD. A small handsome tree, ornamental in spring, when the naked branches are covered with the small but very numerous pinkish-red flowers; leaves round, cordate-pointed, the basal sinus very broad and shallow; pods scarcely stalked in the calyx. N. Y., S. and W.

C. Chinénsis, Bunge (or C. JAPÓNICA), a bushy grower, native to China and possibly to Japan, has more glossy leaves with a sharper point and a narrow, deep basal sinus, and larger rosy-pink flowers. Scarcely hardy in Northern States.

53. CÁSSIA, SENNA. (Ancient name of obscure meaning.) Flowers summer.

* *Smooth herbs; leaflets rather large; stipules deciduous; flowers in short axillary racemes or crowded in a panicle; stamens* 10, *unequal; some of the upper anthers imperfect.*

C. Marilándica, Linn. WILD SENNA. 3°–4° high; leaflets 6–9 pairs, narrow-oblong, blunt, and mucronate; petiole with a club-shaped gland near the base; petals bright yellow, often turning whitish when old; anthers blackish; pods linear, flat (at first hairy). 2ℓ New Eng., W. and S.

C. Tòra, Linn. Leaflets 2 or 3 pairs, obovate, a pointed gland between the lowest; flowers pale, in pairs, and pods slender, curved, 6′–10′ long. ① From Va., S., and Ind. S. W.

C. occidentàlis, Linn. 1°–5° high; leaflets 4–6 pairs, lance-ovate, acute, a globular gland on the base of the petiole; pods narrow-linear, smooth, 5′ long. ① Va. and Ind., S. Nat. from S. A.

* * *Low and spreading, smooth or roughish hairy herbs; stipules persistent, striate; leaflets* 10–20 *pairs, small linear-oblong, oblique, or unequal-sided, somewhat sensitive, closing when roughly brushed; a cup-shaped gland below the lowest pair; flowers clustered in the axils.*

C. Chamæcrísta, Linn. PARTRIDGE PEA. Flowers pretty large, showy, on slender pedicels; petals often purple-spotted at base; style slender; stamens 10, unequal; 4 anthers yellow, the others purple. Sandy fields. ①

C. níctitans, Linn. WILD SENSITIVE PLANT. Flowers small, on very short pedicels, with short style; anthers 5, nearly equal. ① New Eng., S. and W.

54. CÆSALPÍNIA. (For the early Italian botanist, *Cæsalpinus.*)

C. pulchérrima, Swartz. BARBADOES FLOWER FENCE. Small tree, prickly; leaves twice-pinnate; leaflets numerous, oblong, notched at the end; racemes terminal, open; flowers large and showy; petals short-clawed, broad, jagged-edged, 1′ long, reddish orange; filaments crimson, 3′ long. Trop. Africa. Cult. in some conservatories; planted S.

55. GYMNÓCLADUS, KENTUCKY COFFEE TREE. (Greek: *naked branch*, referring to the stout branches destitute of spray.)

G. Canadénsis, Lam. Bark rough; leaves twice-pinnate, 2° or 3° long, each partial leafstalk bearing 7–13 ovate stalked leaflets, except the lowest pair, which are single leaflets (2′–3′ long); the leaflets standing edgewise; flowers in early summer; ripening in late autumn; large thick-walled pods, 5′–10′ long and 1½′–2′ wide; seeds bony, over ½′ across. W. N. Y. S., and especially W.

56. GLEDÍTSCHIA, HONEY LOCUST. (For the early German botanist, *Gleditsch.*) Flowers early summer, inconspicuous; pods ripening late in autumn. Thorns simple or compound; those on the branchlets are above the axils.

G. triacánthos, Linn. A rather tall tree, with light foliage; thorns large (sometimes wanting), often very compound, flattish at the base and tapering; leaflets small, lance-oblong; pods linear, flat, 9′–20′ long, often twisted or curved. Rich soil from W. N. Y., S. and W. (Lessons, Figs. 95, 160.)

G. aquática, Marsh. WATER LOCUST. Small tree; thorns slender; leaflets ovate or oblong; pods oval 1-seeded, containing no pulp. Swamps Mo. to S. Ind., S. C. and S.

57. MIMÒSA, SENSITIVE PLANT. (Greek: *a mimic*, i.e. the movements imitating an animal faculty.) (Lessons, Fig. 490.)

M. pùdica, Linn. COMMON S. Beset with spreading bristly hairs and somewhat prickly; leaves very sensitive to the touch, of very numerous linear leaflets on 2 pairs of branches of the common petiole, crowded on its apex, so as to appear digitate; flowers in slender-peduncled heads, in summer. Cult. from South America. ①

58. SCHRÁNKIA, SENSITIVE BRIER. (For a German botanist, *Schrank.*) Two species wild in dry sandy soil, S. and W., spreading on the ground, appearing much alike, with leaves closing like the Sensitive Plant, but only under ruder handling; flowers in globular heads on axillary peduncles, in summer. ♃

S. uncinàta, Willd. Stems, petioles, peduncles, and oblong-linear short-pointed pods beset with rather stout, hooked prickles; leaflets elliptical, reticulated with strong veins underneath.

S. angustàta, Torr. & Gray. Prickles scattered, weaker, and less hooked; leaflets oblong-linear, not reticulated; pods slender, taper-pointed.

59. DESMÁNTHUS. (Greek: *bond, flower;* the flowers are crowded in a head.)

D. brachýlobus, Benth. Nearly smooth, 1°–4° high, erect; partial petioles 6–15 pairs, each bearing 20–30 pairs of very small, narrow leaflets; one or more glands on the main petiole; small heads of whitish flowers, followed by short 2–6 seeded pods; stamens 5. ♃ Prairies from Ind. S. and W.

60. ALBIZZIA, SILK FLOWER. (Named for an Italian botanist.)

A. Julibrissin, Durazz. SILK-FLOWER or SILK TREE. Planted S.; small tree; leaves of 8–12 pairs of partial petioles, each with about 60 oblong, acute leaflets, which appear as if halved; panicled heads of rather large, pale, rose-purple flowers; filaments conspicuous, long, and lustrous, like silky threads in tufts (giving the popular name); pod 5′–6′ long, oblong-linear, very flat and thin. Asia.

A. lophántha, Benth. A greenhouse shrub; leaves with 8–10 pairs of partial petioles, each with 50–60 linear bluntish leaflets; flowers yellow. New Holland.

61. ACÀCIA. (Ancient name of Acacia trees.) No native species north of Texas. The following are cult. in conservatories N., and one of them planted or run wild far S.

§ 1. *Leaves twice pinnate, of very numerous small leaflets.*

A. dealbàta, Link. A fast-growing small tree, not prickly nor thorny, pale or whitened with minute obscure down or mealiness; leaves of 10–25 pairs of partial petioles (a little gland on the main petiole between each pair), and very many pairs of closely set, minute, linear leaflets; flowers bright yellow in globular heads in an ample very open raceme or panicle, odorous. Australia.

A. Farnesiàna, Willd. OROPANAX. Native of South America; naturalized along the Gulf of Mexico, sometimes cult.; a nearly smooth shrub, with pairs of short prickles along the branches, small linear leaflets, small heads, on short peduncles (2 or 3 together) of yellow, very sweet-scented flowers, used by the perfumers. The plant also yields gum. Pod thick, pulpy or pithy within.

§ 2. *Only the leaves of the seedling twice-pinnate; the rest simple and entire mostly blade-like petioles (phyllodia*, Lessons, p. 61), *standing edgewise, but otherwise imitating rigid simple leaves. Chiefly Australia.*

* *Leaves short, and with only a central nerve or midrib.*

+– *Linear awl-shaped or almost needle-shaped, prickly-tipped, small, about* $\frac{1}{2}'$ *long.*

A. juniperìna, Willd. Rigid bushy shrub; leaves scattered; flowers in single, small, round heads.

A. verticillàta, Willd. Spreading shrub or low tree; leaves crowded more or less in whorls of 5–8 or more; flowers in cylindrical spikes.

+– +– *Obliquely oblong, lanceolate, or broader, not prickly-tipped.*

A. armàta, R. Br. Tall-growing shrub; branches usually hairy; stipules conspicuous, prickle-like; leaves mostly blunt, half-ovate, oblong or incurved-lanceolate, with somewhat wavy margins, feather-veined, not over 1′ long; flowers in round heads.

A. vestìta, Ker. Tall-growing shrub, soft-downy; branches drooping; leaves pale, obliquely wedge-ovate or obovate and curved, bristle-pointed; small, globular heads of flowers in racemes.

* * *Leaves 3′–6′ or more long, pointless, with 2–5 parallel nerves, or when very narrow only* 1*-nerved; flowers in slender, loose, or interrupted axillary spikes.*

A. longifòlia, Willd. Shrub or small tree, smooth; branches angular; leaves from lance-oblong to linear, greatly varying, 2–5-nerved, often faintly veiny between the nerves.

A. lineàris, Sims. Like the preceding, but leaves (2′–10′ long) very narrow-linear and with only one obvious nerve.

XXXVII. ROSACEÆ, ROSE FAMILY.

Trees, shrubs, or herbs with alternate stipulate leaves and regular flowers, with usually indefinite unconnected stamens inserted on the calyx, one, few, or many simple separate pistils (except in the division to which the Pear belongs), and single, few, or occasionally numerous seeds; these filled with a straight embryo. Calyx usually of 5 sepals, but sometimes reinforced by a row of sepal-like bracts beneath. Petals as many as the sepals, or sometimes wanting. Destitute of noxious qualities (excepting the bark, leaves, and kernels of some Cherries, the Almond, etc.), and furnishing the most important fruits of temperate climates, as well as the queen of flowers. We have three principal great divisions.

I. ALMOND or PLUM SUBFAMILY; consists of trees or shrubs, with simple leaves, stipules free from the petiole (often minute or early deciduous, so that there may appear to be none), a calyx which is deciduous after flowering, and a single pistil, its ovary superior and tipped with a slender style (Lessons, p. 95, Fig. 271), containing a pair of ovules, and becoming a simple drupe or stone-fruit. (Lessons, p. 120, Fig. 375.)

1. PRUNUS. Calyx with a bell-shaped or urn-shaped tube and 5 spreading lobes. Petals 5, and stamens 3–5 times as many, or indefinitely numerous, inserted on the throat of the calyx. Flowers white or rose-color.

II. ROSE SUBFAMILY PROPER: consists of herbs or shrubs, with stipules either free from or united with the base of the petiole, calyx persisting below or around the fruit, which is composed of sometimes one, but commonly several or many distinct pistils.

§ 1. *Calyx not a fleshy tube or cup, nor closed over the fruit.*

* *Ovaries about* 5 (2–12), *becoming little pods, mostly several-*(1-10-) *seeded; calyx with only* 5 *or rarely* 4 *lobes.*

2. SPIRÆA. Shrubs or perennial herbs, with stipules sometimes minute or obsolete, sometimes conspicuous, and white or rose-purple, sometimes dicœcious flowers. Calyx open and short, mostly 5-cleft, not inclosing the pods. Petals equal, commonly broad. Stamens 10–50. Pods not inflated, 1-valved. Seeds linear.
3. PHYSOCARPUS. Shrubs, differing from Spiræa by inflated 2-valved pods, and roundish seeds.
4. EXOCHORDA. Shrubs with large white flowers, 5 bony 2-valved carpels joined to a common axis, each with one large flat winged seed.

5. GILLENIA. Herbs, with nearly white flowers and almost sessile leaves of 3 leaflets. Calyx narrow, oblong, 5-toothed, enclosing the 5 pistils (which at first lightly cohere in a mass) and the little pods. Petals rather unequal, lance-linear. Stamens 10–20, not projecting.

* * *Ovaries few or many, single-ovuled, becoming dry akenes in fruit above the open and mostly spreading calyx; stamens numerous.*

\+ *Pistils few, only* 2–8.

6. KERRIA. Shrub, with long green branches, simple and coarsely toothed alternate leaves and yellow flowers terminating the branchlets of the season. Calyx with 5 somewhat toothed large lobes. Petals 5.
7. RHODOTYPOS. Shrub, with large, opposite leaves. Petals 4. Sepals large, becoming leaf-like in fruit. Akenes as large as peas, jet-black and shining.
8. WALDSTEINIA. Low perennial herbs, with chiefly root-leaves, either lobed or compound, and a few yellow flowers on a short scape. Calyx with a top-shaped tube and 5 spreading lobes, alternate with which are sometimes 5 minute teeth or bractlets. Petals obovate. Styles deciduous by a joint.

\+ \+ *Pistils numerous and heaped in a head; calyx (except in one,* Geum) *augmented with additional outer lobes or bractlets alternating with the* 5 *proper lobes; leaves mostly compound.*

9. GEUM. Perennial herbs. Calyx with a bell-shaped, top-shaped, or hemispherical tube or cup. Akenes narrow, or tapering to the base, tipped with the long persistent style, or the greater portion of it, in the form of a naked or hairy tail. Seed erect. Receptacle dry, conical, or cylindrical.
10. POTENTILLA. Herbs, or one species shrubby. Calyx flat or widely open. Akenes small, on a dry receptacle, from which they at length fall.
11. FRAGARIA. Perennial, small, and stemless herbs, producing runners after flowering. Leaves compound, of 3 leaflets. Calyx open, flat. Styles short and lateral. Akenes naked, small, on the surface of an enlarged pulpy edible receptacle. (Lessons, p. 113, Fig. 360, and p. 118, Fig. 368.)

* * * *Ovaries several or many,* 2-*ovuled, in fruit becoming fleshy or pulpy and* 1-*seeded, forming a head or cluster above the flat or widely open simply* 5-*cleft calyx; stamens numerous; styles short, naked, at length falling off.*

12. DALIBARDA. Very low perennial tufted herb, with simple, rounded-heart-shaped or kidney-shaped root-leaves and 1–2-flowered scapes. Calyx of 5 or even 6 unequal sepals. Ovaries 5–10, in fruit merely fleshy, becoming almost dry and bony.
13. RUBUS. Perennial herbs or shrubby plants. Ovaries numerous, in fruit pulpy (berry-like, or more properly drupe-like, the inner hard part answering to the stone of a cherry or peach on a small scale), crowded on the dry or fleshy receptacle. (Lessons, p. 118, Figs. 369, 370.)

§ 2. *Calyx with an urn-shaped dry tube, contracted or nearly closed at the mouth, and inclosing* 1–4 *little pistils which become akenes. Flowers small; petals none except in* Agrimonia.

14. ALCHEMILLA. Low herbs, with palmately lobed or compound leaves, and minute greenish flowers, in clusters or corymbs. Calyx with 4 inner and 4 outer or accessory spreading lobes. Petals none. Stamens 1–4. Pistils 1–4, with lateral styles.
15. AGRIMONIA. Herbs, with interruptedly pinnate leaves, and flowers in slender terminal spikes or racemes. Calyx with the top-shaped tube beset with hooked bristles just below the 5 green lobes, the latter closing together in fruit. Petals 5, commonly yellow, broad and spreading. Stamens 5–15. Pistils 2; styles terminal.
16. POTERIUM. Herbs, with odd-pinnate leaves, and white, purple, or greenish flowers (sometimes dicœcious) in dense heads or spikes on long, erect peduncles. Calyx with a short, 4-angled, closed tube, surmounted by 4 broad and petal-like at length deciduous lobes. Petals none. Stamens 4–12 or more, with long and slender projecting filaments. Pistils 1–4; the terminal styles tipped with a brush-like or tufted stigma.

§ 3. *Calyx with an urn-shaped or globose fleshy tube or "hip," contracted at the mouth, inclosing the many pistils and akenes. Flowers large and showy.*

17. ROSA. Shrubby, mostly prickly, with pinnate leaves of 3–9 or rarely more serrate leaflets, stipules united with the base of the petiole, and flowers single or in corymbs terminating leafy branches. Calyx with 5 sometimes leafy lobes which are often unequal and some of them toothed or pinnately lobed. Petals 5, or more in cultivation, broad, inserted along with the many stamens at the mouth of the calyx tube. Pistils numerous, with terminal styles, and one-ovuled ovaries, becoming hard or bony akenes, inclosed in the tube or cup of the calyx, which in fruit becomes pulpy and imitates a berry or pome. (Lessons, p. 113, Fig. 361.)

III. PEAR SUBFAMILY. Consists of shrubs or trees, with stipules free from the petiole (often minute or early deciduous); the thick-walled calyx-tube becoming fleshy or pulpy and consolidated with the 2–5 ovaries to form a compound pistil and the kind of fruit called a pome. (Lessons, p. 119, Fig. 374.) Lobes of the calyx and petals 5. Stamens numerous, or rarely only 10–15.

* *Fruit drupe-like; the seeds solitary in a hard stone or stones.*

18. CRATÆGUS. Trees or shrubs, mostly with thorny branches and flowers in corymbs or cymes, or sometimes solitary, terminating the branchlets; the leaves lobed or serrate. Styles 2–5 (or rarely 1); ovary of as many 2-ovuled cells. Fruit with a stone of 2–5 (rarely single) 1-seeded cells or carpels, more or less cohering with each other.

19. COTONEASTER. Shrubs (exotic), usually low, with the small coriaceous leaves entire and whitish-downy underneath, small clustered flowers, and the calyx white-woolly outside. Styles 2–5. Fruit small, the pulpy calyx-tube containing 2–5 little seed-like, hard stones.

* * *Fruit with thin and cartilaginous or papery 2-several-seeded carpels in the pome.*

+ *Leaves persistent.*

20. PHOTINIA. Trees or shrubs (exotic), not thorny, with ample evergreen leaves. Flowers corymbed. Styles 2–5, dilated at the apex. Fruit berry-like, the 2–5 partitions thin, or vanishing.

+ + *Leaves deciduous.*

21. AMELANCHIER. Trees or shrubs, not thorny, with simple leaves, racemed flowers, and narrow white petals. Styles 5, united below. Ovary of 5 two-ovuled cells, but each cell soon divided more or less by a projection or growth from its back, making the berry-like fruit 10-celled.

22. PYRUS. Trees or shrubs, sometimes rather thorny, with various foliage, and flowers in cymes, corymbs, or rarely solitary. Styles 2–5. Ovary of 2–5 two-ovuled (or in cultivated species, and in Cydonia, several-ovuled) cells, which are thin and papery or cartilaginous in fruit in the fleshy or pulpy calyx tube.

1. PRÙNUS, PLUM, PEACH, CHERRY, etc. (The ancient Latin name of the Plum.) Shrubs or trees, mostly with early and showy flowers.

§ 1. ALMONDS, etc. *Flowers solitary or in twos or threes, usually very early, sessile, or short-stalked; leaves folded together lengthwise (conduplicate) in the bud; fruit pubescent (or rarely smooth) at maturity, the stone compressed and thick-walled, more or less deeply wrinkled and pitted.*

* *Shrubs known as Flowering Almonds.*

P. Japónica, Thunb. COMMON FLOWERING ALMOND. Cult. from China and Japan; a low shrub, with handsome blush or rose-colored double or

semi-double (very rarely single) flowers, usually in twos or threes, on stalks about an inch long, appearing with the leaves; leaves ovate-lanceolate, smooth, finely serrate. Generally, but erroneously, called P. NÀNA in gardens.

P. tríloba, Lindl. FLOWERING ALMOND. Cult. from China; bush with nearly sessile, usually very double (rarely semi-double) flowers, pink or rose-colored, borne singly and appearing before the leaves; the latter broadly ovate or obovate, and rather abruptly pointed, slightly hairy, coarsely toothed or even jagged above, sometimes obscurely three-lobed

* * *Small trees, bearing fruit of commercial value.*

P. Amýgdalus, Baill. The COMMON ALMOND. Cult. from the Orient; tree 10° to 20° high, with large sessile flowers, which appear before the leaves and persist for many days; leaves lanceolate, firm, and very closely serrate; fruit with a dry flesh, which finally splits away, freeing the large softish stone, which is the Almond of commerce.

P. Pérsica, Sieb. & Zucc. PEACH. From China; differs from the last in its thinner, broader, and more coarsely serrate leaves and thick-fleshed, edible fruit, and mostly smaller, harder, and more deeply marked stone. Var. *necturìna*, Maxim. The NECTARINE. Has a smooth fruit, usually smaller. Var. *platycárpa* is the PEEN-TO or FLAT PEACH of the S.

P. Simònii, Carr. SIMON OR APRICOT PLUM. Small, fastigiate tree from China, cult. for its large, depressed, handsome maroon-red smooth fruits; flowers pink-white, very short-stalked, borne singly or in pairs before the leaves appear; leaves lance-oblong or lance-obovate, thick and firm, dull, conduplicate, closely serrate; flesh of the very firm fruit yellow, and clinging to the small spongy-roughened pit.

§ 2. APRICOTS. *Flowers much as in* § 1; *leaves convolute or rolled up in the bud; fruit pubescent or smooth, the stone compressed, bearing one prominent margin, and either smoothed or slightly roughened.*

P. Armeniáca, Linn. COMMON APRICOT. Native of China; flowers pink-white, sessile and appearing singly before the leaves; the latter varying from ovate to round-ovate, prominently pointed and toothed, and long-stalked; fruit ripening (in the N.) in July and August, smooth, the large, flat, smooth stone nearly or quite free. The RUSSIAN APRICOT is a hardy race of this.

P. dasycárpa, Ehrh. BLACK OR PURPLE APRICOT. Small tree, much like the last, but the flowers prominently stalked; the leaves thinner and narrower, with smaller serratures; fruit dull purple and fuzzy, the flesh clinging to the thick, scarcely margined, pubescent stone. Nativity unknown.

§ 3. PLUMS, etc. *Flowers stalked in umbel-like fasicles, appearing either before or with the leaves; leaves either conduplicate or convolute in the bud; fruit more or less globular and covered with a bloom, smooth, with a compressed mostly smooth stone.*

* *Small trees;* PLUMS.

† *Exotic or foreign species.*

P. spinòsa, Linn. A low and spreading, thorny, European tree, appearing in this country chiefly in the double-flowered variety; flowers borne singly or in pairs (rarely in 3's), very small as compared with the garden Plum; leaves small and mostly obovate and obtuse (or in some forms very blunt-pointed), finely and doubly serrate, rugose, and more or less hairy beneath; fruit small and round, purple, scarcely edible.

P. doméstica, Linn. COMMON PLUM. Probably Asian; flowers showy (white), more or less fascicled; leaves large, ovate, or obovate usually,

firm and thick in texture, very rugose, usually pubescent beneath, coarsely serrate; shoots usually downy; fruit very various, of many shapes and flavors, but mostly globular-pointed or oblong, the stone large and slightly roughened or pitted. Perhaps derived from the last.

P. cerasífera, Ehrh. MYROBALAN OR CHERRY PLUM. Differs from the last in a more slender habit, often thorny; flowers mostly smaller; leaves smaller, thin, smooth, and finely and closely serrate; fruit globular and cherry-like, ranging from the size of a large cherry to over an inch in diameter, with a depression about the stem, in various shades of red or yellow. Much used for stocks, and rarely grown for its fruit. Perhaps a derivative of P. spinosa. Var. PISSÁRDI is a form with purple leaves and purple-fleshed fruit.

P. triflòra, Roxb. JAPANESE PLUM. Strong growing tree, recently imported from Japan (native to China?) in several varieties; flowers usually densely fascicled; leaves and shoots smooth and hard, the former obovate or oblong-obovate, prominently pointed, and finely and evenly serrate; fruit usually conspicuously pointed, red, yellow, or purple, with a very firm flesh and commonly a small stone.

\+ \+ *Native species.*

P. umbellàta, Ell. Small bushy tree of the S. States; flowers appearing with the leaves, 2 or 3 or more together on slender pedicels nearly an inch long, rather large, white; leaves smallish, ovate, or slightly obovate, or sometimes short-oblong, thin and dull, closely and evenly serrate; fruit about three fourths of an inch in diameter, yellow, or reddish, the flesh firm and austere; stone short and turgid, cherry-like. Often called HOG PLUM.

P. Americàna, Marsh. COMMON WILD PLUM. A spreading, ragged, often thorny, small tree, growing along streams and in copses from W. New England to Col. and Tex.; flowers large and white on slender pedicels, appearing before or with the leaves; the latter large, obovate, abruptly pointed and coarsely toothed or even jagged above, very coarsely veined, never glossy or shining; fruit more or less flattened upon the sides, firm and meaty, the skin tough and glaucous and never glossy, dull yellow variously splashed or overlaid with dull red; stone large and usually flattened, mostly nearly smooth and distinctly margined. Many varieties in cultivation for their fruits.

P. hortulàna, Bailey. WILD GOOSE PLUM. Strong, wide-spreading, small trees with smooth straight twigs and a peach-like habit, wild in the Mississippi Valley; flowers rather small, often very short-stalked; leaves narrow-ovate or ovate-lanceolate, thin and firm, flat, more or less peach-like, smooth and usually shining, closely and obtusely glandular-serrate; fruit spherical, bright colored and glossy (lemon-yellow or brilliant red), the bloom very thin, juicy, with a clinging, turgid, and roughish, small, pointed stone. Many varieties in cultivation.

P. Chicàsa, Michx. (more properly P. ANGUSTIFÒLIA). CHICKASAW PLUM, MOUNTAIN CHERRY. Smaller tree than the last, with slender, zigzag, red twigs and smaller, lanceolate or oblong-lanceolate leaves which are very closely and finely serrate, shining, and conduplicate or trough-like in habit; fruit small and very early, red or rarely yellow, the skin thin and shining, and covered with many small light dots and a very thin bloom; the flesh soft and juicy, often stringy, closely adherent to the small, broad, roughish stone. Wild from Del. S. & W., and also cultivated.

* * *Shrub;* BEACH PLUM.

P. marítima, Wang. A straggling, more or less decumbent bush from 3 to 12 feet high, growing in the sand on the seashore; flowers small and pediceled, opening slightly in advance of the leaves; the latter oval, thick and heavily veined, finely but sharply serrate, becoming nearly

smooth; fruits a half inch in diameter, deep dull purple, and very glaucous, with a tough skin and usually acerb flesh; stone cherry-like, but distinctly margined, entirely free from the flesh. Cult. sparingly for ornament and for fruit.

§ 4. Fascicled Cherries, Edible. *Flowers usually fascicled or umbellate, stalked, usually appearing with the leaves, the latter conduplicate in the bud; fruit small and mostly globular, and nearly always smooth and destitute of bloom; the stone nearly or quite spherical and mostly smooth.*

* *Shrubs, native.*

P. pùmila, Linn. Dwarf or Sand Cherry. A straggling shrub, usually with decumbent base, the stronger branches erect, the plant finally reaching a height, perhaps, of 6 or 8 feet; flowers small, on slender stalks, with the leaves somewhat preceding them; leaves long, oblanceolate, thick in texture and veiny, sharply serrate; fruit mostly black, the size of a small Garden Cherry, varying from astringent to sweet. Along rivers and coasts, in the N. States. Cult. for fruit and flowers.

P. cuneàta, Raf. A slender, upright shrub, with larger flowers and short-obovate or spatulate, thin leaves, which are less prominently toothed. Grows in bogs and other cool land in the N. States.

* *Small trees.*

+ *Garden or exotic cherries, grown only for ornament.*

P. subhirtélla, Miq. (or P. péndula). Rosebud, or Japanese Weeping Rose-flowered Cherry. A handsome tree, with tortuous or weeping branches, and very early rose-colored flowers in simple umbels on slender hairy bractless pedicels, the calyx funnel-form and red; petals obcordate, notched; leaves ovate (or oblong-ovate on strong shoots), veiny and slightly hairy below, prominently pointed and rather coarsely sharp-toothed. Japan.

P. Pseudo-Cérasus, Lindl. Japanese Flowering Cherry. A strong tree with much the aspect of a Sweet Cherry; cult. from China and Japan for its very large and pretty rose-colored double (rarely single) flowers, which are borne in a stalked and more or less branching umbel-like cluster, with large obovate, jagged bracts; leaves large and veiny, dull, ovate or ovate-lanceolate, with very sharp teeth or often even jagged, and prominent toothed or laciniate stipules. Var. ***Siebòldi***, Maxim., differing in having the young growth pubescent, is also in cultivation.

P. semperflòrens, Ehrh. Ever-flowering or All Saint's Cherry. A small tree with leaves like the Morello Cherry (those on the flowering shoots smaller and more jagged), but producing flowers more or less continuously throughout the summer. These late flowers are solitary, with conspicuous, glandular-serrate calyx lobes; fruit small, red, and sour. Probably derived from the next.

+ + *Garden or exotic cherries grown chiefly for fruit.* (*Double-flowered forms occur.*)

++ *Flower-clusters disposed along the branches.*

P. Cérasus, Linn. Sour, Pie, Morello and Early Richmond Cherries. Griottes. A low-headed tree, with spreading grayish branches; flowers in small clusters from lateral buds, mostly in advance of the leaves, the persistent bud-scales small; leaves hard and stiff, short-ovate or ovate-obovate, the point rather abrupt, smooth, and more or less glossy, light or grayish green; fruit roundish, red, in various shades, tart. Eu.

P. Àvium, Linn. Mazzard, Sweet, Heart and Bigarreau Cherries. Guignes or Geans. Taller, with a more erect growth, and reddish brown,

more or less glossy bark; flowers usually borne in dense clusters on lateral spurs, and appearing with the hairy conduplicate young leaves, the persistent bud-scales large; leaves mostly oblong-ovate and gradually taper-pointed, dull and soft, hanging limp upon the young growths, Birch-like in aspect; fruit sweet (or sometimes sour, as in May Duke), yellow or red, often pointed. Eu. Often escaped into woods.

†† †† *Flower-clusters borne on the ends of the branches.*

P. Mahàleb, Linn. MAHALEB CHERRY. Slender small tree, with small, fragrant flowers in terminal, umbel-like clusters; leaves bright green, broadly ovate or round-ovate and more or less heart-shaped, the point short, smooth and veiny, the margins finely and obtusely serrate; fruits very small, dark red, austere. Used for stocks upon which to propagate cherries, and occasionally running wild. S. Eu.

† † † *Native, very rarely cultivated.*

P. Pennsylvánica, Linn. WILD RED, BIRD, or PIN CHERRY. Rocky woods N.; small tree, with light, red-brown bark; oblong-lanceolate and pointed leaves, smooth and green both sides, their margins finely and sharply serrate; small flowers on long pedicels; and light, red, sour fruit, not larger than peas.

§ 5. RACEMED CHERRIES. *Flowers small, in distinct racemes.*

† *Drooping racemes in late spring or early summer, terminating leafy shoots of the season.*

P. serótina, Ehrh. WILD BLACK CHERRY. Tree or shrub, westward becoming a good-sized forest tree, with bitter aromatic bark, close-grained reddish wood valued by the cabinet-maker; the oblong or lance-oblong shining leaves of thickish or firm texture, usually taper-pointed, serrate, with incurved, short, callous teeth; flowers in long racemes, considerably later than the next; purplish-black, bitterish, vinous fruit, ripening in autumn or late summer.

P. Virginiàna, Linn. CHOKE CHERRY. Tall shrub or small tree, with grayish bark, oval-oblong or obovate and abruptly pointed thin leaves, very sharply serrate with slender projecting teeth; flowers in shorter and closer racemes, in spring; the fruit ripe in summer, red, turning dark crimson; astringent, but edible when fully ripe; the stone smooth.

P. Pàdus, Linn. SMALL BIRD CHERRY of Eu., is occasionally planted; resembles the last; has longer and looser, often drooping racemes, which are a week later and usually more leafy, and a roughened stone.

† † *Erect racemes in early spring, from the axils of evergreen leaves.*

P. Caroliniàna, Ait. CAROLINA LAUREL CHERRY, also called MOCK ORANGE at the South, probably from the coriaceous, smooth, and glossy leaves, which are lance-ovate or oblong, entire or with a few sharp and appressed teeth, longer than the racemes, the calyx as well as petals white; small fruit, black and bitter, becoming dry. Ornamental small tree.

2. SPIRÆA, SPIRÆA, MEADOWSWEET, etc. (Greek: *twist*, referring to a peculiarity of the pods of one species.) All hardy shrubs or perennial herbs; flower late spring and summer.

§ 1. *Shrubs, with simple leaves.*

* *Native species, but the last common in gardens.*

S. betulifòlia, Pall., var. **corymbòsa**, Wats. From S. Penn. S. and W., not common; shrub 1°–2° high, smooth, with oval leaves, cut-toothed towards the apex; and white flowers, in a flat, compound corymb.

S. tomentòsa, Linn. HARDHACK or STEEPLE BUSH. Common in low grounds; 2°–3° high; hoary-downy, except the upper face of the ovate or oblong, serrate, small leaves; the rose-purple or white flowers crowded in a very dense terminal panicle; pistils downy.

S. salicifòlia, Linn. COMMON MEADOWSWEET. Common in wet grounds, also in old gardens; shrub 2°–3° high, bushy, smooth, with wedge-lanceolate or oblong leaves, simply or doubly serrate, and white or barely flesh-colored flowers in a crowded panicle.

* * *Cultivated for ornament, exotic or W. North American.*

+– *Flowers in close or spike-like clusters collected in a close and narrow or spike-like terminal panicle, pink-purple.*

S. Douglásii, Hook. DOUGLAS'S MEADOWSWEET. Cult. from Ore. and Cal.; resembles our wild Hardhack (S. tomentosa), but has longer, usually lance-oblong and very blunt leaves, rather whiter beneath, and deeper pink flowers with smooth pistils. S. NOBLEÀNA is a form of this, with smoother leaves and broader clusters.

+– +– *Flowers in compound corymbs or broad panicles.*

S. Japónica, Linn. (Known also as S. CALLÒSA and S. FORTÙNEI). From Japan and China; shrub 3°–6° high, smoothish, with lance-oblong and taper-pointed, unequally and very sharply serrate leaves; branches terminated by clustered, pubescent, dense corymbs or cymes of deep pink flowers; 10 glands at the mouth of the calyx; the pistils smooth. Common. S. PANICULÀTA of gardens is a form with more panicled inflorescence.

S. discolor, Pursh., var. ***ariæfòlia***, Wats. Tall shrub from Ore., with slender branches, terminated by a very large and light or drooping decompound panicle of small, yellowish-white flowers; the leaves roundish-ovate, very obtuse, thin, cut on each side into 4 or 5 blunt and toothed lobes, sometimes almost pinnatifid, soft-downy, at least beneath.

+– +– +– *Flowers in simple, often umbel-like corymbs terminating leafy shoots of the season; natives of Europe and Asia; petals white (except the first species.)*

S. bélla, Sims, from Nepal; a low shrub, with ovate, acute and merely sharply serrate leaves, whitish-downy beneath, the simple corymbs sometimes clustered, and rose-pink flowers.

S. rotundifòlia, Lindl., from India, has roundish obovate small leaves, which are entire below and sparingly toothed on the broad, obtuse summit, and flowers in compact clusters.

S. chamædrifòlia, Linn., from E. Eu. and Siberia; a spreading low bush, smooth, with ovate or oblong, usually blunt and cut-toothed leaves, at least towards the summit, and rather small flowers in simple corymbs. S. OBLONGIFÒLIA is a form with narrower leaves.

S. ulmifòlia, Scop., from Siberia, is very like the last, but distinguished by the ovate-lanceolate leaves which are more or less ciliate on the edges.

S. trilobàta, Linn. (or S. TRÍLOBA of gardens), from Siberia; a spreading smooth bush, with rounded crenately cut and 3-lobed leaves and rather showy flowers. S. VAN HOÚTTEI is an improved form of this, with larger stature and more profuse bloom.

S. cratægifòlia, Link. Leaves ovate and pointed, toothed and cut, scarcely lobed; flowers in small stalked umbels; hardy and showy. Native country unknown.

S. Cantoniénsis, Lour., (known also as S. LANCEOLÀTA and S. REEVESIÀNA), from China, has oblong, lance-oblong, or some three-cleft serrate-toothed leaves, and showy flowers,

S. hypericifòlia, DC. Italian May or St. Peter's Wreath. Shrub 3°–6° high, smooth or smoothish, with long recurved branches, and very small, wedge-oblong leaves, a little toothed or lobed at the end; flowers small, white, early, in small sessile umbels. S. crenàta is a form with obovate and crenulate leaves. Asia.

+ + + + *Flowers in simple, sessile umbels along the slender branches of the preceding year, subtended only by greenish bud-scales or imperfect leaves, rather earlier than the proper leaves, in spring.*

S. prunifòlia, Sieb., from Japan; slender shrub, with small, ovate, finely and sharply serrate leaves, smooth above, often minutely downy beneath; the form usually cultivated has full-double, pure white blossoms, ⅓′ in diameter, produced in great abundance.

S. Thunbérgii, Sieb., from Japan; dwarf compact shrub with slender and somewhat drooping branches; leaves linear or linear-lanceolate, sharply toothed, yellowish-green; flowers small and white, the umbels arranged in long open sprays, very early.

§ 2. *Shrubby, with pinnate leaves.*

S. sorbifòlia, Linn. Cult. from Siberia, very hardy, 3°–4° high, with leaves (as the name denotes) resembling those of the Mountain Ash, of 17–21 lanceolate, taper-pointed, doubly and sharply serrate leaflets, and white flowers in an ample terminal panicle, the narrow pods a little cohering; common in old gardens.

§ 3. *Herbs, with thrice pinnately-compound leaves, no stipules, and diœcious flowers.*

S. Arúncus, Linn. Goat's Beard. Rich woods from N. Y. S. and W., also in some gardens; smooth, 3°–5° high; with lance-oblong or lance-ovate taper-pointed leaflets, sharply serrate and cut, and yellowish white, very small flowers in great numbers, crowded in slender spikes which are collected in a great compound panicle; petals narrow; pedicels reflexed in fruit.

Var. ***astilboìdes,*** Maxim., from Japan, is smaller (2°), with pedicels erect in fruit.

§ 4. *Herbs with interruptedly pinnate leaves, conspicuous stipules, perfect flowers, reflexed sepals and petals sometimes* 4, *and* 5–12 *little* 1–3*-seeded pods.*

S. Filipéndula, Linn. Dropwort. Cult. from Eu.; some of the coarse, long, fibrous roots swollen at the lower end into oblong tubers; herbage smooth and green; leaves chiefly from or near the ground, with many oval or lanceolate leaflets deeply toothed, cut, or pinnately cleft, and gradually diminishing in size downwards; the nearly naked stems 1°–2° high, bearing a compound terminal cyme of white or rosy-tipped flowers, one variety full-double.

S. Ulmària, Linn. English Meadowsweet. Cult. from Eu.; 1°–3° high, nearly smooth, except the lower surface of the lyrate and interruptedly pinnate leaves which is minutely white-downy; the yellowish-white, small, and sweet-scented flowers very numerous and crowded in a compound cyme at the naked summit of the stems, sometimes double; little pods twisting spirally. There is a variety with variegated foliage.

S. lobàta, Jacq. Queen of the Prairie. Wild in meadows and prairies from Penn., W., also cult.; smooth and green; the leaves mostly from or near the ground; the end leaflet very large, 7–9-parted, and its lobes cut-toothed; stems 2°–5°, or even 8° high, bearing an ample and panicled compound cyme crowded with the handsome peach-blossom-colored flowers. Bruised foliage exhales the odor of Sweet Birch.

3. PHYSOCÁRPUS, NINE-BARK. (Greek name, compounded of *bladder* and *fruit*, in allusion to the inflated pods.)

P. (or SPIRÆA) **opulifòlia**, Maxim. NINE-BARK. So-called from the loose bark, separating in thin annual layers from the stems; a tall shrub, with long recurving branches; the roundish and mostly heart-shaped leaves partly 3-lobed and cut-toothed; white flowers in umbel-like corymbs; the pods commonly turning purplish. Wild on rocky banks, from N. Y., W. and S.; often cultivated.

4. EXOCHÓRDA. (Latin: *exo*, external, and *chorde*, a cord or thong, in reference to the structure of the fruit.)

E. grandiflòra, Lindl. PEARL BUSH. A beautiful shrub, or even small tree; cult. from China for its large white flowers, which appear with the leaves in long axillary racemes, leaves oblanceolate, whitish below, very strongly toothed on strong shoots, but almost entire upon the older parts.

5. GILLÈNIA, INDIAN PHYSIC, AMERICAN IPECAC. (For *Dr. Gillen* or *Gillenius*.) Flowers summer. 2

G. trifoliàta, Mœnch. COMMON I. or BOWMAN'S ROOT. Rich woods from N. Y. S. and W.; smooth, branching, 2° high, with the 3 ovate-oblong pointed leaflets cut-toothed, entire stipules small and slender, and rather pretty white or scarcely rosy-tinged flowers loosely panicled on the slender branches.

G. stipulàcea, Nutt. LARGE-STIPULED I. OR AMERICAN IPECAC. Open woods, W. N. Y. and W.; has the lanceolate leaflets and leaf-like stipules deeply cut and toothed; otherwise like the other.

6. KÉRRIA. (Named for *Bellenden Ker*, a British botanist.)

K. Japónica, DC. CORCHORUS (incorrectly), JAPANESE ROSE, from Japan; a familiar, smooth, ornamental, shrubby plant, with weak, bramble-like and green branches, 4°–8° high, with lance-ovate thin leaves, and handsome yellow flowers, in summer, usually full-double; the natural state, with 5 petals and numerous stamens, less common. There is a form with variegated leaves.

7. RHODOTÝPOS. (Name means *rose-type*.)

R. kerrioìdes, Sieb. Cult. from Japan; a bush of medium size, with large, ovate, thin, opposite leaves, which are coarsely and sharply toothed and hairy below; flowers solitary and terminal, an inch across, light yellow or cream-color, succeeded by shining, black, bead-like akenes, which are subtended by the very large and leafy calyx lobes.

8. WALDSTEÌNIA. (Named for *F. von Waldstein*, an Austrian botanist.)

W. fragarioìdes, Tratt. BARREN STRAWBERRY. Wooded banks, chiefly N. and S. along the mountains; in aspect and especially in the 3 broadly wedge-shaped leaflets resembles a Strawberry Plant (as the specific and the popular names denote), but is smoothish and yellow-flowered; flowers in summer on several-flowered bracted scapes. 2

9. GÈUM, AVENS. (From Greek word, meaning to give an agreeable flavor; the roots of some species somewhat scented.) Several wild species, only the following common; flowers late spring and summer. 2

* *Flowers purple; style becoming plumose on the end.*

G. rivàle, Linn. PURPLE OR WATER AVENS. In bogs and low grounds N.; thickish rootstock (sometimes used in medicine as an

astringent) sending up lyrately and interruptedly pinnate leaves, and rather naked, several-flowered stems (2° high); the flowers pretty large, nodding, with purplish-orange and broadly obovate or obcordate petals narrowed at the base, never spreading; in fruit the head of akenes erect, stalked in the persistent calyx, the persistent styles jointed and bent in the middle, the upper part plumose-hairy.

* * *Flowers white or yellow; style not plumose.*

+ *Head of fruit sessile in the calyx.*

G. strictum, Ait. FIELD A. Moist grounds and fields; a coarse herb, 3°–5° high, rather hairy, with root-leaves interruptedly pinnate and the leaflets wedge-obovate, those of the stem with 3–5 narrower leaflets; in summer bearing panicled flowers with broadly obovate golden-yellow petals exceeding the calyx; stipules large, deeply cut; the persistent, naked style hooked at the end after the short upper joint falls; receptacle downy.

G. Virginiànum, Linn. WHITE A. Thickets and borders of woods; coarse and bristly-hairy herb 1°–3° high, with root and lower leaves of several pinnate leaflets, the upper 3-parted and cut; the panicled flowers small, with inconspicuous greenish-white petals shorter than the calyx; head of fruit like the last, but its receptacle smooth or very nearly so.

G. álbum, Gmelin. WHITE A. Grows in similar places with the preceding, and like it, but smooth or soft-pubescent, with root-leaves of 3–5 leaflets, or some of them rounded and simple except a few minute leaflets below; the petals as long as the calyx, white or pale greenish-yellow; receptacle bristly.

+ + *Head of fruit stalked in the calyx.*

G. vérnum, Torr. & Gray. SPRING A. Thickets, from Penn. to Ill. and Ky.; slender, 2°–3° high; root-leaves rounded, heart-shaped, and 3–5-lobed, or some of them pinnate and cut; flowers small, with yellow petals about the length of the simply 5-lobed calyx; styles smooth, the upper joint falling off; receptacle smooth.

10. POTENTÍLLA, CINQUEFOIL, FIVE-FINGER. (Name means *powerful*, from reputed medicinal virtues.) Mostly wild plants in the country; several are cultivated.

§ 1. *Petals pale yellow, small, not surpassing the calyx.* ① ②

P. Norvègica, Linn. NORWAY C. An erect, hairy, weedy plant, 1°–2° high, branching above, with only 3 obovate-oblong and cut-toothed leaflets; flowers summer, in fields.

P. supìna, Linn. A spreading or decumbent, pubescent, weedy plant, on river banks W., with pinnate leaves of 5–11 obovate-oblong, cut-toothed leaflets, and akenes with a thick appendage at their base; flowers summer.

§ 2. *Petals whitish or cream-color, broad, surpassing the calyx; akenes smooth.* 2

P. argùta, Pursh. A stout, erect, brownish-hairy, coarse plant, 1°–4° high, rather clammy above, on rocky hills N. and W., with pinnate leaves of 5–11 oval or ovate, cut-toothed leaflets, soft-downy beneath, and a close terminal cluster of rather large flowers, in summer.

§ 3. *Petals bright yellow, larger than the lobes of the calyx.* 2

* *Leaves of 5 or more digitate leaflets.*

P. récta, Linn. Cult. in some old gardens, from Eu.; a coarse, erect, hairy plant, 2°–3° high, with sometimes 7 narrowly wedge-oblong leaflets, coarsely toothed, and rather large, cymose flowers.

P. Canadénsis, Linn. Common Wild C. or Five-finger. Open, dry ground; dwarf, silky-hairy, with wedge-obovate leaflets, and axillary, 1-flowered peduncles; flowering from early spring to midsummer, and spreading by runners. A prostrate plant, variable, resembling a Strawberry.

P. argéntea, Linn. Silvery C. Dry fields, banks, and roadsides N.; a low, spreading or prostrate, much branched, white-woolly weed, with wedge-oblong, cut-pinnatifid leaflets green above, white with silvery wool beneath, and the margins revolute; the small flowers somewhat panicled; all summer.

* * *Leaves pinnate; receptacle and sometimes the akenes white-hairy.*

P. Anserìna, Linn. Silverweed. Wet banks and sandy shores, N. and W.; leaves all from the root or in the tufts at the joints of the long, slender runners, green above, silvery with silky down beneath, of 9–19 oblong, cut-toothed principal leaflets and some pairs of minute ones intermixed; stipules conspicuous and many-cleft; flowers solitary on long, scape-like peduncles, all summer.

P. fruticòsa, Linn. Shrubby C. Wet grounds N.; 2°–4° high, woody, silky, very much branched, with 5 or 7 crowded, oblong-lanceolate, entire leaflets, scale-like stipules, and loose clusters of rather showy flowers, all summer. Cultivated.

§ 4. *Petals white; akenes and receptacle hairy; leaflets only 3, digitate.* 2l

P. tridentàta, Ait. Three-toothed C. Coast of N. England N. and W. and on mountains; 4′–6′ high, tufted, spreading, with 3 thickish, nearly smooth leaflets, coarsely 3-toothed at the end, and several flowers in a cyme, in early summer. Cultivated.

§ 5. *Petals purple, rose-color, or crimson; akenes smooth.* 2l

* *Wild in wet and cold bogs N.; petals narrow, shorter than the calyx.*

P. palústris, Scop. Marsh Five-finger. Stems ascending from an almost woody creeping base; leaves pinnate, of 5–7 lance-oblong serrate and crowded leaflets, whitish beneath; flowers in a small cyme, the calyx nearly 1′ broad, the inside as well as the petals, dull dark purple; receptacle becoming large and spongy; flowers all summer.

* * *From Himalaya, occasionally cult. for ornament; petals large, obcordate.*

P. Nepalénsis, Hook. Nepal C. Leaflets 3 in the upper, 5 in the lowest leaves, digitate, hairy but green both sides, wedge-oblong, coarsely toothed; flowers rose-red, all summer. P. Hopwoodiàna, with flesh-colored flowers, is a garden hybrid of this and P. recta.

P. atrosanguínea, Lodd. Dark Nepal C. Is soft silk-hairy, with 3 leaflets to all the leaves, and much darker-colored flowers than in the preceding, brown-purple or crimson.

11. FRAGÀRIA, STRAWBERRY. (Name from *fraga*, the old Latin name of the strawberry, referring to the fragrance.) 2l

§ 1. True Strawberries. *Petals white; receptacle of the fruit high-flavored; scapes several-flowered; runners naked. Flowers in spring and early summer, those of all but the first species inclined more or less to be diœcious.*

F. vésca, Linn. Common S. of Eu. Yields the Alpine, Perpetual, etc., its American form (var. **Americàna**, Porter) plentifully native N.; is mostly slender, with thin, dull leaflets, strongly marked by the veins, calyx remaining open or reflexed after flowering, small ovoid-conical or elongated fruit, high-scented, and the akenes superficial. The flowers usually stand above the leaves.

F. moschàta, Duchesne (or F. ELÀTIOR), HAUTBOIS S., of Eu. sometimes cult. is taller and quite dicœcious, more pubescent, with the calyx strongly reflexed away from the fruit, which is dull, reddish, and musky-scented.

F. Virginiàna, Duchesne. WILD S. Original of several varieties once cult. but now lost; has leaflets of firm texture, their smooth and often shining upper surface with sunken veins, flowers usually below the leaves, calyx becoming erect after flowering and closing over the hairy receptacle when unfructified; fruit with a narrow neck, mostly globular, its surface with deep pits in which the akenes are sunken, nodding on slender pedicels.

Var. **Illinoénsis**, Gray. Is coarser and larger, grows in richer soil, from W. N. Y., W. and S.; the hairs of the scape, etc., shaggy.

F. Chiloénsis, Duchesne. GARDEN STRAWBERRY. From Chile, but also native all along the Pacific coast, has a low habit and thick, dark colored leaves which are bluish-white below, and is clothed with long, shaggy hairs; scapes and runners strong; fruit large and usually dark colored, with a very large "hull" or calyx. The var. ANANÁSSA, or PINE STRAWBERRY, is a horticulturally modified form, comprising the common garden strawberries.

§ 2. *Petals yellow; receptacle tasteless; runners bearing leaves and* 1-*flowered peduncles; calyx with* 5 *external pieces very large, leaf-like, and* 3-*lobed.*

F. Índica, Andr. INDIAN S. Of Upper India, etc.; cult., running wild S. E.; rather handsome both in flower and (red) fruit, which are produced all summer and autumn.

12. DALIBÁRDA. (*Thomas Dalibard*, an early botanist of Paris.) ♃

D. rèpens, Linn., of wooded slopes N., is a low, stemless, tufted, downy little plant, spreading more or less by subterranean runners, with the aspect of a Violet, the scapes bearing 1 or 2 delicate white flowers, in summer; leaves roundish and cordate, crenate. It sometimes produces cleistogamous flowers.

13. RÙBUS, BRAMBLE, etc. (The Roman name, connected with *ruber*, red.) ♃ A large and difficult group, comprising the Raspberries and Blackberries.

§ 1. FLOWERING RASPBERRIES, *with simple leaves and broad, flattish fruit, the very small and numerous reddish or amber-colored grains at length separating from the persistent receptacle.*

R. odoràtus, Linn. PURPLE F., MULBERRY (erroneously). Dells, etc., N.; shrubby, 3°–5° high, clammy-bristly and odorous, not prickly; ample 3–5-lobed maple-like leaves, the lobes pointed and the middle one longest; peduncles many-flowered; calyx-lobes with long slender tips, and petals purple-rose-color; the showy flowers 1′–2′ across, produced all summer. Cultivated.

R. Nutkànus, Moçino. WHITE F. From Upper Mich. to Pacific. Like the other, but less bristly and clammy, with leaves more equally 5-lobed and coarsely toothed, and fewer flowers, with narrower white petals. Cultivated.

§ 2. TRUE RASPBERRIES (*or the first doubtful*), *with* 3–5 *leaflets, the fruit falling when ripe from the then dry, narrow receptacle; flowers with small, white, erect petals, in early summer, on leafy shoots of the season which* (*in all but the first*) *spring from prickly more or less woody stems of the preceding year.*

* *Trailing; nearly herbaceous.*

R. triflòrus, Rich. DWARF RASPBERRY. Almost wholly herbaceous, slender, trailing, not prickly, with thin, smooth leaves of 3 rhombic-ovate

acute leaflets, or the side-leaflets parted, making 5, all doubly serrate; peduncle bearing 1–3 small flowers, and the fruit of few grains. Low woods, N.

* * *Bushes; the canes woody.*

+– *Not hairy, although bristly or prickly.*

R. occidentàlis, Linn. Black R., Blackcap, or Thimbleberry. Borders of fields and thickets N., especially where ground has been burned over; glaucous-whitened, the long, recurving stems, stalks, etc., armed with hooked prickles, but no bristles; leaflets mostly 3, ovate, pointed, white-downy beneath, coarsely doubly toothed, the lateral ones stalked; flowers in close umbel-like clusters, or some of them somewhat scattered, the petals shorter than the sepals; fruit purple-black (or an amber-colored variety), flattish, ripe at midsummer. Parent of the Black Raspberries of the garden.

R. strigòsus, Michx. Wild Red R. Common especially N.; 2°–3° high, the upright stems, stalks, etc., beset with copious bristles, and some of them becoming weak prickles, also glandular; leaflets oblong-ovate, pointed, cut-serrate, white-downy beneath, the lateral ones (either 1 or 2 pairs) not stalked; flowers in more or less raceme-like clusters, the petals as long as the sepals, the latter more or less glandular; fruit light red, tender and watery, but high flavored, ripening all summer. Parent of some of the Red Raspberries of the garden.

R. neglectus, a hybrid between the last two, has given rise to the Shaffer, Philadelphia, and other garden varieties of the Purple Cane class.

R. Idæus, Linn. European Raspberry. Tall and nearly erect, beset with straight, slender prickles, or many of them mere bristles, the canes whitish; leaves thicker, and fruit firmer and larger than in R. strigosus, red or yellowish, ripening through the summer; calyx glandless. Parent of the Antwerp and other garden Raspberries; once much grown, but now mostly out of cultivation in this country.

+– +– *Densely glandular-hairy.*

R. phœnicolàsius, Maxim. Wineberry. Strong bush with the habit of a raspberry, the branches covered with a copious red hair; the dull and sparsely hairy, wedge-ovate or wedge-cordate, toothed, and jagged leaflets very white-tomentose below; flowers in fascicled clusters; the soft reddish fruits at length inclosed in the great hairy calyx, edible. Japan.

§ 3. Blackberries and Dewberries; *with the pulpy grains of the fruit remaining attached to the pulpy receptacle, which at length falls away from the calyx; stems prickly; leaves of 3 or pedately 5–7 leaflets; flowers on leafy shoots from stems of the preceding year, in spring and early summer, with white spreading petals.*

* *Stems more or less woody; fruit black (rarely amber) when ripe, edible, ripening in summer and autumn.*

+– *Stems more or less erect, not propagating from the tip.* — Blackberries.

R. villòsus, Ait. High Blackberry. Everywhere along thickets, fence-rows, etc.; stems 1°–6° high, furrowed; prickles strong and hooked; leaflets 3–5, ovate or lance-ovate, pointed, their lower surface and stalks hairy and glandular, the middle one long-stalked and sometimes heart-shaped; flowers rather large, with short bracts, in distinct leafless racemes; fruit oblong or cylindrical. The common Blackberry of gardens, running into many forms.

Var. **albìnus**, Bailey. White Blackberry. Canes bright yellowish-green, and the fruit short and amber or cream-colored. In the N. States; also cult.

Var. **frondòsus**, Torr., is dwarfer, has narrower leaflets, and a short and leafy inflorescence. N. States; also cult.

Var. **montànus**, Porter, occurs on high hills from N. Y. southward, and is known by lower habit, mostly redder stems, and sometimes fewer prickles, shorter clusters, and especially by dry, "seedy," spicy, or bitterish, thimble-shaped berries.

Hybrids occur between R. villosus and R. Canadensis, as in the garden variety, Wilson Early, and others.

R. Millspaùghii, Britton. Thornless Blackberry. Stems nearly or wholly thornless, and leaflets narrower (mostly ovate-lanceolate), the middle three long-stalked; inflorescence short, less pubescent than in the preceding. N. States and southward along the mountains.

R. cuneifòlius, Pursh. Sand B. Sandy ground and barrens from N. J., S.; erect, 1°–3° high, with stout hooked prickles; the branchlets and lower surface of the 3–5 wedge-obovate, thickish leaves whitish-woolly; peduncles 2–4-flowered.

R. laciniàtus, Willd. Cut-leaved or Evergreen Blackberry. Leaflets 3, each pinnately divided into lobed and cut portions; flower clusters small, whitish-pubescent; stems with recurved prickles. Probably a form of the European R. fruticosus.

+ + *Stems trailing, decumbent, or ascending, mostly rooting at the tips.* — Dewberries.

R. Canadénsis, Linn. Low B. or Dewberry. Rocky and sandy soil; long-trailing, slightly prickly, smooth or smoothish, and with 3–7 small, doubly-toothed leaflets; the racemes erect and 1–3-flowered, with leaf-like bracts, the fruit of fewer grains and ripening earlier than the Blackberries. Several varieties are cultivated.

Var. **roribáccus**, Bailey, native of W. Va., is the Lucretia Dewberry, distinguished by strong growth, wedge-obovate, jagged leaflets, long flower stalks, and large flowers (sometimes 2′ across), with leafy sepals.

Var. **invìsus**, Bailey. Parent of Bartel and other cultivated Dewberries; has somewhat ascending round stems, and leaflets which are coarsely and always simply toothed; N.

R. triviàlis, Michx. Southern Low B. Sandy soil from Va., S.; widely trailing or creeping, bristly and very prickly; the smooth, partly evergreen leaves of 3–5 ovate-oblong or lance-oblong leaflets; peduncles 1–3-flowered. Cult.

R. setòsus, Bigel. Ascending; the older stems densely clothed with very slender but stiff, slightly bent prickles; leaflets ovate to ovate-oblanceolate, pointed, scarcely shining, very strongly toothed; fruit reddish-black. Woods and glades, Penn. and N.

* * *Stems scarcely woody, but lasting over winter, wholly prostrate; fruit reddish, sour.*

R. híspidus, Linn. Running Swamp B. Low woods and sandy places, etc., N.; with very long and slender running stems, beset with small reflexed prickles, sending up short, leafy, and flowering shoots; leaves of mostly 3 obovate blunt, smooth, and shining leaflets, of firm and thickish texture, somewhat evergreen; flowers small and few, on a leafless peduncle; fruit of few grains, red or purple.

§ 4. Flowering Bramble; *cultivated for the flowers only.*

R. rosæfòlius, Smith, from China, called Brier Rose. Cult. in greenhouses and apartments, has pinnate leaves, and bears a succession of full-double white flowers, resembling small roses.

14. ALCHEMÍLLA. (Name said to come from the Arabic.) A minute annual species, A. arvénsis, called Parsley Piert in England, is introduced in Va. and N. C.

A. vulgàris, Linn. Lady's Mantle, from Eu., is cult. in some gardens; it is a low herb, not showy, with somewhat downy, rounded, slightly 7–9-lobed leaves, chiefly from the root, on long stalks, and loose corymbs or panicles of small light green flowers through the summer. 2

15. AGRIMÒNIA, AGRIMONY. (Old name, of obscure meaning.) Weedy herbs, in fields and borders of woods, producing their small yellow flowers through the summer; the fruiting calyx, containing the 2 akenes, detached at maturity as a small bur, lightly adhering by the hooked bristles to the coats of animals. 2

A. Eupatòria, Linn. Common A. Principal leaflets 5–7, oblong-obovate and coarsely toothed, with many minute ones intermixed; petals twice the length of the calyx; stamens 10–15.

A. parviflòra, Ait. From N. Y., S.; has smaller flowers, 11–19 lanceolate principal leaflets, and 10–15 stamens.

A. incìsa, Torr. & Gray. Only S.; has 7–9 oblong or obovate and smaller principal leaflets, small flowers, and 5 stamens.

16. POTÈRIUM, BURNET. (Old Greek name, of rather obscure application.) 2

P. Sanguisórba, Linn. Garden or Salad B. Common in old gardens (used for salad), from Eu.; nearly smooth, growing in tufts; leaves of many small ovate and deeply toothed leaflets; stems about 1° high, bearing a few heads of light green or purplish monœcious flowers, in summer, the lower flowers with numerous drooping stamens, several of the uppermost with pistil, the style ending in a purple, tufted stigma.

P. Canadénse, Benth. & Hook., or Sanguisórba Canadénsis, Canadian or Wild B. Wet grounds N.; 3°–6° high, nearly smooth, with numerous lance-oblong, coarsely-toothed leaflets, often heart-shaped at base, and cylindrical spikes of white, perfect flowers, in late summer and autumn; stamens only 4, their long, white filaments club-shaped.

17. RÒSA, ROSE. (The ancient Latin name of the Rose.) (Lessons, Fig. 218.)

§ 1. Wild Roses *of the country; only the first species much cultivated.*

* *Styles lightly cohering in a column and projecting out of the calyx-cup.*

R. setígera, Michx. Prairie or Climbing Wild Rose. Rich ground, W. and S.; also planted; represented by the original of Queen of the Prairie, Baltimore Belle, etc. Tall-climbing, armed with stout, nearly straight prickles, not bristly; stems glaucous; leaves with only 3–5 ovate acute leaflets; the corymbed flowers produced towards midsummer; stalks and calyx glandular; petals deep rose, becoming nearly white.

* * *Styles separate, included in the calyx-tube, the stigmas closing its orifice; stems not disposed to climb.*

R. Carolìna, Linn. Swamp Rose. Wet grounds; stems 4°–8° high, with hooked prickles and no bristles, glaucous; leaflets 5–9, smooth, dull above and pale beneath, finely serrate; flowers numerous in the corymb (in summer); the calyx and globular hip glandular-bristly. Flowers bright rose-red.

R. lùcida, Ehrh. Dwarf Wild Rose. Moist places and swamps, N. Y. to Newf.; has stem from 1°–5° high, with stout, more or less hooked spines; leaflets about 7, rather small, thick and shining, oval or oval-obovate, and coarsely toothed above; flowers solitary or in loose corymbs, light rose-colored, the calyx lobes hispid and more or less prolonged, and occasionally notched.

R. hùmilis, Marsh. In drier soil, and extending farther W.; lower (1°–3°), with nearly straight spines; larger and thin dull leaflets; flowers generally solitary or nearly so, and the outer sepals nearly always lobed.

R. blánda, Ait. Early Wild Rose. Rocky banks N.; 1°–3° high, with only straight, weak prickles, or commonly none; 5–7 oval or cuneate blunt and pale leaflets, sometimes hoary beneath; large stipules; 1–3-flowered peduncles, and the sepals hispid but entire; the hip globular; flower solitary or corymbose, large, in spring or early summer.

§ 2. Brier Roses; *naturalized from Europe, by roadsides and in thickets, or sometimes planted; flowering in summer.*

R. rubiginòsa, Linn. Sweetbrier. Tall, disposed to climb, armed with strong and hooked, and some slender and awl-shaped prickles; the roundish and doubly-serrate small leaflets downy and beset with russet glands beneath, giving the aromatic fragrance; flowers mostly solitary, pink; hip pear-shaped, oblong, or obovate, crowned with the calyx lobes.

R. canìna, Linn. Dog-rose. Roadsides E.; resembles Sweetbrier, but the leaflets smooth or destitute of aromatic glands and simply serrate; flowers 3 or 4 together, pink or nearly white; fruit from nearly globular to oblong-ovate.

§ 3. Evergreen Roses; *naturalized in the Southern States from China; flowering in spring; the flowers not double.*

R. lævigàta, Michx. (or R. Sínica of Aiton). Cherokee Rose. Planted for garden hedges, etc., also run wild S.; disposed to climb high, armed with strong hooked prickles, very smooth, with bright green and glossy evergreen leaves of mostly only 3 leaflets, and single flowers at the end of the branches, with bristly calyx cup and large pure-white petals. Occasional in greenhouses N.

R. bracteàta, Wendl. Bracted Rose. In hedges far S., not common; has downy branches armed with strong, hooked prickles, 5–9 roundish leaflets, and single large white flowers on very short peduncle, the calyx covered by leafy bracts.

§ 4. Exotic Garden Roses proper; *from Europe and Asia. Merely the principal types; the greater part of the modern garden roses much mixed by crossing and changed by variation.*

* *Styles united in a column which projects out of the calyx cup. All with long, rambling shoots, or disposed to climb.*

R. sempérvirens, Linn. Evergreen Rose, of S. Not hardy or holding its leaves N.; with coriaceous, bright-green, oblong leaflets, curved prickles, and nearly solitary white flowers, not double. The Ayrshire Rose is evidently an offshoot of R. arvensis, a closely related species.

R. multiflòra, Thunb. Many-flowered Rose. A well-known half-climbing species, from Japan and China, hardy in Middle States, with branches, peduncles, and calyx more or less tomentose; 5 or 7 soft and somewhat rugose leaflets, slender, scattered prickles, and full corymbs of small flowers, white, pale red, or rose-purple, not sweet-scented. The double form is an old garden rose, but the single form is not common. The Polyantha Roses are offshoots of this, chiefly through hybridization with Rosa Indica.

R. moschàta, Mill. Muscat or Musk Rose. Not climbing, with slender curved prickles; leaves of 5 or 7 lanceolate and pointed leaflets, a corymb of white flowers, with a yellowish base to the petals, very sweet scented, especially at evening.

* * *Styles not sensibly projecting, nor united.*

+ *Tender, tall-climbing, and wholly destitute of prickles.*

R. Bánksiæ, R. Br. Banksia Rose, from China. A slender conservatory species (in the N.), very smooth, with 3–5-lanceolate glossy leaflets, and umbels of very small, white or buff and violet-scented flowers.

+ + *Tender, armed only with distant hooked prickles, with leaves of mostly* 3 (3–5) *rather coriaceous and shining leaflets.*

R. Índica, Linn. India or China Roses. Includes the Tea, Perpetual or Bengal, Bourbon, and Noisette Roses; and the Bengal Pompons, etc., are miniature forms of similar origin. A plant of upright habit, smooth, the peduncle thickened upwards, calyx either smooth or bristly. Long grown and very variable.

+ + + *Hardy or mainly so at the north, not climbing, more or less prickly, and with leaves of* 5 *or more leaflets.*

R. alpìna, Linn. Alpine Rose, of Eu. Grows 5°–8° high, unarmed or with a few purplish spines, hispid peduncles, erect and solitary blush flowers, and a more or less pendulous, orange-red, oblong or obovate fruit. The Boursalt Roses are derived from this, probably crossed with the China Rose, and are mostly smooth-stemmed plants of somewhat climbing habit and large double flowers.

R. Gállica, Linn. French or Red Rose. Has slender stems beset with both stout curved and slender straight prickles; leaves of 5–7 rather rigid doubly and glandular-toothed leaflets more or less downy beneath, erect 1-flowered peduncles, and pink-red or crimson (or variegated with white), spreading petals which have some astringency and are used for *conserve of roses*, and a globose fruit.

R. centifòlia, Linn. Hundred-Leaved, Provence, or Cabbage Rose. Has mostly straight prickles, 5–7 oval leaflets with glandular teeth or edges, peduncle and calyx clammy, with odorous glands, the hip bristly and glandular; the flowers mostly nodding, large, and full-double, rose-purple, or of various shades, rarely white; fruit oblong. Pompon Roses are miniature varieties. Moss Roses are abnormal states (var. muscòsa) with the glands and bristles of the calyx and peduncle developed into a moss-like substance. Petals used for *rose-water*, *essence of roses*, etc.

R. Damascèna, Mill. Damask Rose. Known from the foregoing by the greener bark, larger curved prickles, corymbed flowers oblong in the bud, and with the long sepals (some of them pinnatifid or lobed) reflexed during flowering, the hip oblong and pulpy; petals rose-purple, white, etc.; used in preference for *attar-of-roses* and rose-water. Hybrid Perpetual Roses are largely derived from this through hybridization with forms of R. Indica and others.

R. álba, Linn. White Rose. Leaflets 5, glaucous and a little downy beneath; prickles straightish and slender; sepals reflexed and lobed; petals pure white or delicate blush, fragrant; fruit oblong and red.

R. cinnamòmea, Linn. Cinnamon Rose, of Eu. Met with in country gardens; is related to our wild R. blanda; 5° to 8° high, with brownish-red bark, and some straightish prickles; pale leaves downy underneath, and small, pale-red, cinnamon-scented (mostly double) flowers, not showy; fruit roundish, red.

R. spinosíssima, Linn. Burnet or Scotch Rose, of Eu. Low, 1° or 2° high, exceedingly prickly with straight prickles, with 7 to 9 small and

roundish smooth leaflets, and small early flowers, either single or double, and white, pink, and even yellow, the hips cartilaginous, roundish, and dark purple.

R. Eglantèria, Linn. Yellow Eglantine Rose. Like a Sweetbrier, but lower, 3°–5° high, with scattered, straight prickles; leaves deep green and sweet scented; flowers deep yellow, orange, or buff, and sometimes variegated with red, either single or double. The Austrian Brier, and the Persian Yellow and Harrison's Yellow are forms of this (var. lùtea).

R. sulphùrea, Ait. The old Yellow Rose, from the far East. Tall, with scattered prickles, glaucous or pale scentless leaves, and sulphur-yellow (full-double) flowers in summer.

R. rugòsa, Thunb. Japanese Rose. Spreading bush, very densely clothed with long, stout, and straight spines; leaflets 7–11, round-ovate, thick, dark green above and tomentose below, coarsely toothed, the stipules leafy; flowers large and mostly single, white or red; the calyx lobes 1′ or 2′ long, and tomentose, persistent on the very large, nearly globular, orange-red hip.

18. CRATÆGUS, HAWTHORN, WHITETHORN. (Greek: *strength,* from the hard wood.) Small trees or shrubs, with hard wood; flowers white, except in some varieties of English Hawthorn, in spring or early summer; ripening the red or reddish fruit mostly in autumn. (Lessons, Fig. 273.)

§ 1. *Flowers many in the corymb, small, with 5 styles; fruit not larger than small peas, scarlet or coral-red; leaves, etc., smooth, or nearly so.*

C. Pyracántha, Pers. Evergreen Thorn. Planted for ornament and sparingly nat. from S. Penn. S. (from S. Eu.); shrub 4°–6°, with the shining evergreen leaves lance-spatulate and crenulate, only 1′ long, and small clusters of flowers terminating short branches.

C. spathulàta, Michx. Tall shrub or low tree, from Va. S., with almost evergreen, shining, spatulate leaves, crenate towards the apex, or on vigorous shoots, cut-lobed, and with hardly any petiole.

C. cordàta, Ait. Washington T. Small tree, from Va. and Ky. S., and has been planted for hedges; has broadly triangular-ovate or heart-shaped, thinnish leaves, often 3–5-cleft or cut and serrate, on slender petiole.

§ 2. *Flowers many in the corymb, middle-sized; fruit coral-red, ovoid, rather small; styles* 1–5.

C. víridis, Linn. (or C. arboréscens). River banks far S.; tree with few stout thorns or none; thin, oblong serrate leaves, acute at both ends, on slender petioles; styles 5.

C. Oxyacántha, Linn. English Hawthorn. Planted from Eu. for ornament and hedges; tree or shrub with obovate, smooth leaves, wedge-shaped at base, cut-lobed and toothed above; styles 2 or 3, rarely only 1. With single or double, white, rose, or pink-red flowers.

C. apiifòlia, Michx. Common S. Small tree, soft-downy when young; the leaves smoothish with age, pinnatifid, the 5–7 lobes crowded, cut and toothed; petioles slender; styles 1–3.

§ 3. *Flowers many in the corymb, large; the calyx-teeth with the bracts and stipules often beset with glands; fruit edible, half an inch or more long, its cells or stones and the styles variable in number,* 1–5. *All tall shrubs or low trees, of thickets and rocky banks, or planted.*

C. coccínea, Linn. Scarlet-fruited T. Smooth, with the leaves thin, roundish-ovate, sharply cut-toothed or lobed, on slender petioles,

the coral or scarlet fruit much smaller than in C. tomentosa next and hardly edible.

Var. **macracántha**, Dudley. Has very long thorns, thick wedge-shaped leaves deeply incised, and larger flowers and fruit.

Var. **mollis**, Torr. & Gray, larger plant, with densely pubescent under-surfaces of leaves and shoots, and earlier, larger flowers. All forms in N. States.

C. tomentòsa, Linn. Pear Thorn or Blackthorn. Downy or soft-hairy when young; the leaves thickish, oval, or ovate-oblong, sharply toothed or cut, below abruptly narrowed into a margined petiole, the upper surface impressed along the main veins or ribs; flowers late, often 1′ broad; scarlet or orange fruit from two thirds to three fourths of an inch long, pleasant-tasted. N. Y., W. and S.

C. punctàta, Jacq. Leaves wedge-obovate, the long lower portion entire, toothed above and rarely indistinctly lobed, plicate and dull, pubescent below when young, but becoming smooth; fruit large and spherical, red or yellow; branches horizontal in mature specimens. Common.

C. Crus-gálli, Linn. Cockspur T. Smooth; the wedge-obovate or oblanceolate leaves thick and firm, deep-green and glossy, serrate above the middle, tapering into a very short petiole; thorns very long and sharp; fruit bright red. Useful for hedges. (Lessons, Fig. 96.)

§ 4. *Flowers solitary, in pairs, or only 3–6 in the corymb; styles and cells, 4–5; leaves mostly pubescent underneath; fruit often edible.*

C. æstivàlis, Torr. & Gray. Summer Haw of S. States. Along pine-barren ponds, from S. Car. S. and W.; small tree with spatulate or wedge-obovate coriaceous leaves, crenate above the middle; no glands; 3–5-flowered peduncles, and large red juicy fruit, pleasantly acid, used for tarts, etc.; ripe in summer.

C. flàva, Ait. Yellow or Summer Haw. Sandy soil, from Va. S. and W.; small tree, with wedge-obovate leaves, downy or smoothish, toothed or cut above the middle, the teeth or margins and short petiole glandular; the pear-shaped or globular fruit yellowish, greenish, or tinged with red.

C. parvifòlia, Ait. Small-leaved or Dwarf Thorn. Mostly in pine barrens from N. J., S.; shrub 3°–6° high, downy, with thick and firm spatulate-obovate, crenate leaves, these as well as the mostly solitary flowers almost sessile; calyx-lobes glandular-toothed and as long as the petals; the large fruit pear-shaped or globular, at first hairy, greenish and yellowish.

19. COTONEÁSTER. (Name alludes to the cottony covering of the shoots, lower face of the leaves, etc.) Small-leaved and small-flowered, chiefly Old-World shrubs.

C. vulgàris, Lindl. Planted from Eu.; hardy shrub, 2°–4° high, much branched, with deciduous ovate leaves, hardly 1′ long, white-tomentose below, glabrous calyx, flesh-colored or white flowers in spring, and reddish fruit.

C. nummulària, Lindl. From Nepal, is a large shrub or low tree, with nearly orbicular leaves, which are dull below, and bright red fruits.

20. PHOTÍNIA. (Greek: *shining*, alluding to the glossy leaves of the genuine species.) Choice greenhouse shrubs or small fruit trees, hardy S., with large evergreen leaves.

P. (or *Eriobòtrya*) *Japónica*, Gray. The Loquat Tree of Japan, with large, obovate toothed leaves, nearly 1° long, the lower surface and corymb clothed with dense rather rusty loose wool; has few and large downy yellowish-white flowers, appearing in autumn, and an edible yellow, acid fruit, with 1–5 large seeds. Often called, erroneously, Japan Plum.

21. AMELÁNCHIER, JUNEBERRY, SERVICE BERRY. (Popular name of the European species in Savoy.) Flowering in spring, and producing the berry-like purplish fruit (edible, sweet, sometimes very pleasant-flavored) in summer.

A. Canadénsis, Torr. & Gray. SHAD BUSH of New England, is a tree 10°–30° high, glabrous or very nearly so; the leaves ovate and pointed, light green above, very sharply serrate, Birch-like; flowers large, in open and loose, more or less drooping racemes, before the leaves; the calyx lobes lanceolate; fruit a purple, berry-like pome in June and July, much relished by birds. The flowers appear in profusion in advance of the leaves.

Var. **oblongifòlia**, Torr. & Gray (or A. OBLONGIFÒLIA, Roemer). Is a low plant (2°–5° high), with oblong, mostly blunt leaves, which are floccose or woolly below, and nearly erect, woolly, panicle-like racemes, appearing with the leaves; growing in the N. States and known in cultivation as the DWARF JUNEBERRY.

22. PÝRUS, PEAR, APPLE, etc. (Classical name of the Pear tree.) Botanically the genus is made to include a great variety of plants, agreeing in the cartilaginous, parchment-like, or thin-walled cells that contain the seeds. Wood hard and tough. Flowers spring.

§ 1. PEAR. *Leaves simple; flowers in a simple corymb or cluster; fruit generally with its base tapering down to the stalk.*

P. commùnis, Linn. COMMON PEAR. Cult. from Eu.; a smooth tree, with branches inclined to be thorny; ovate leaves with small, obtuse teeth, and pure white flowers, the anthers purple.

P. Sinénsis, Lindl. JAPAN OR SAND PEAR. Cult. from China and Japan, is a stronger grower than the last, with larger dark leaves which are very sharply toothed, and tough, gritty fruits which are often depressed about the stem, and Apple-like. KIEFFER, LE CONTE, and others, are hybrids with the last.

§ 2. APPLE. *Leaves simple; flowers showy, in a simple cluster or simple umbel; fruit sunken (umbilicate) at both ends, especially at the base.*

* *Exotic; leaves simply and evenly serrate, ovate or oblong.*

P. Màlus, Linn. COMMON APPLE. Cult. from Eu.; tree with buds, lower face of the leaves (when young) and calyx woolly; flowers white and tinged with pink, on short, woolly peduncles; fruit various, but always holding the calyx lobes upon its apex.

P. spectábilis, Ait. CHINESE FLOWERING APPLE. Cult. from China for its showy rose-colored, semi-double or double flowers; is an upright tree with gray branches 20° to 25° high, and hard leaves which soon become nearly smooth, and are evenly and sharply toothed; fruit small, with persistent calyx.

P. baccàta, Linn. CRAB APPLE. From Eu. Small tree with hard, wiry, smooth shoots, long and smooth petioles and pedicels, narrower smooth leaves, and a small, hard, translucent fruit from which the calyx falls before maturity. TRANSCENDENT, HYSLOP, and various other improved Crabs are probably hybrids with P. Malus.

P. floribúnda, Lindl. JAPANESE FLOWERING CRAB. A bush or small tree, perhaps an offshoot from the last; smooth in all its parts, with long-acuminate, mostly sharply toothed leaves; handsome, flesh-colored or rosy flowers and red flower buds, and a profusion of long-stemmed fruits the size of a pea, from which the calyx falls. Semi-double forms are known in gardens as P. HALLIÀNA and P. PARKMÁNI.

* * *Wild species, with some of the leaves irregularly cut-toothed, or even lobed; flowers bright rose-colored, and the fruit greenish.*

P. coronària, Linn. American or Garland Crab Apple. Glades from W. N. Y. to Mich. and S. and sparingly W.; small tree, soon smooth, with the mostly triangular ovate leaves rounded or obscurely heart-shaped at base and inclined to be 3-lobed, on slender smooth petioles; flowers on long, smooth pedicels; fruit bright green, flattened lengthwise.

P. Ioénsis, Bailey. Western Crab Apple. Leaves oblong or obovate-oval, variously notched and toothed, the lower surface as well as the petioles, short pedicels and young growth, white-pubescent; fruit spherical or oblong, dull green with minute light dots. There is a double-flowered variety. W. of Great Lakes.

P. angustifòlia, Ait. Narrow-leaved Crab Apple. Leaves lance-oblong or elliptic and small, almost entire or bluntly and sparsely dentate, obtuse or nearly so, thick, shining above, on short, smooth petioles; flowers rather small, on smooth pedicels. From Penn. S. and W.

§ 3. Chokeberry. *Leaves simple, the upper face with some small glands along the midrib; flowers (white) in compound cymes terminating the branches; styles united at base; fruit berry-like.*

P. arbutifòlia, Linn. Common Chokeberry. Woods and bogs, N.; low, spreading shrub with oblong or oblanceolate serrate leaves, acute or acuminate and pubescent below, and a scarlet or light purple fruit which clings to the branches after the leaves fall.

Var. **melanocárpa**, Hook (or P. nìgra, Sargent), has broadly obovate nearly smooth leaves, earlier flowers, and black fruit which soon falls.

§ 4. Rowan Tree *or* Mountain Ash. *Leaves odd-pinnate, of several (9–17) leaflets; flowers (numerous and white) in ample, compound, flat cymes terminating the branches of the season; fruit berry-like, scarlet-red when ripe. Trees often planted for ornament, especially for the clusters of showy fruit in autumn.*

P. Americàna, DC. American Mountain Ash. Slender tree or tall shrub, wild in the cooler districts; smooth or soon becoming so, with lanceolate taper-pointed and sharply serrate bright-green leaflets on a reddish stalk, pointed and smooth glutinous leaf-buds, and berries not larger than peas.

P. sambucifòlia, Cham. & Schlecht. Elder-leaved R. or M. Wild along the northern frontiers; smooth or nearly so, with oblong or lance-ovate and blunt or abruptly short-pointed leaflets, coarsely serrate with more spreading teeth, sparingly hairy leaf-buds, and larger berries.

P. Aucupària, Gærtn. European R. or M. Commonly planted from Eu.; forms a good-sized tree, with oblong and obtuse paler leaflets, their lower surface, stalks, and the leaf-buds downy; and the berries larger ($\frac{1}{2}$′ in diameter).

§ 5. Quince. *Leaves simple; flowers either single upon the ends of leafy shoots, or in small, sessile clusters, white or red; fruit more or less pyriform, the 5 cells normally several or many-seeded. Small trees or bushes.*

P. Cydònia, Linn. (or Cydònia vulgàris). Common Quince. From Eu.; a small bushy tree with soft, oval, entire leaves which are tomentose below, and very large flowers terminating short leafy shoots, and woolly fruits. (Lessons, Fig. 112.)

P. Japónica, Thunb. Japan Quince (also named Cydònia Japónica). Thorny, smooth, widely branched shrub from Japan; cult. for the large

showy flowers, which are produced in spring earlier than the oval or wedge-oblong leaves, on side spurs, in great abundance, single or more or less double, scarlet-red, or sometimes almost white varieties; calyx with short and rounded lobes; fruit green-speckled, very hard, sometimes used for jellies.

XXXVIII. CALYCANTHACEÆ, CALYCANTHUS FAMILY.

Shrubs with opposite, entire leaves, no stipules, sepals and petals imbricated and indefinite in number and passing one into the other, stamens few or many, with anthers turned outwards, all these parts on a hollow receptacle or bracted calyx cup in the manner of a rose hip, inclosing numerous pistils which ripen into akenes. Cotyledons rolled up from one margin. Flowers rather large, mostly aromatic, as is the wood also. (Lessons, Fig. 424.)

1. CALYCANTHUS. Flowers livid-purple or dull red, solitary in the axils or terminating leafy branches, with loose bracts passing to colored lanceolate sepals, and these into similar thickish petals, which are borne on the summit of the closed calyx tube; within these are numerous short stamens; the outer having anthers ending in a tip, the inner smaller and with imperfect anthers or none. Pistils inclosed in the fleshy cup; ovary with 2 ovules; styles slender. Akenes oval, coriaceous, inclosed in the leathery hip, which becomes about 2′ long.
2. CHIMONANTHUS. Flowers yellow and purplish, along naked shoots, sessile in axils of fallen leaves. Bracts and sepals scale-like, ovate, purplish, or brownish. Petals honey-yellow, or the innermost red. Stamens with anthers only 5.

1. CALYCÁNTHUS, CAROLINA ALLSPICE or SWEET-SCENTED SHRUB. (Greek: *cup* and *flower*.) All wild in U. S., and cultivated, especially the first, which has fragrant strawberry-scented blossoms. Flowers spring and all summer. Mostly natives of elevated lands.

C. flóridus, Linn. Wild S. of Va. in rich woods; leaves soft-downy beneath, 1′–3′ long, oval or oblong.

C. lævigàtus, Willd. Wild from S. Penn., S. along the Alleghanies. Smooth and green, with oval or oblong leaves 1′–3′ long, and rather small flowers (1½′ across).

C. glaùcus, Willd. Wild from Va., S.; like the foregoing (possibly a variety of it), but with mostly larger and taper-pointed leaves, glaucous beneath.

C. occidentàlis, Hook & Arn. WESTERN C. Smooth, with ovate or ovate-oblong and slightly heart-shaped, larger leaves (5′–6′ long), green both sides, the upper surface roughish; the brick-red flowers 3′ across, scentless; akenes hairy. Cult. from Cal.

2. CHIMONÁNTHUS, JAPAN ALLSPICE. (Greek: *winter-flower;* it flowers in winter in a mild temperate climate.)

C. frágrans, Lindl. Shrub with long branches, which may be trained like a climber, smooth, lance-ovate, pointed leaves, and rather small fragrant flowers; hardy S. of Penn.

XXXIX. SAXIFRAGACEÆ, SAXIFRAGE FAMILY.

A large family not readily defined by any single characters; distinguished generally from Rosaceæ by having albumen in the seeds, ovaries partly or wholly united, and seldom any stipules; the herbs and most of the shrubs of the family have only as many or twice as many stamens, and fewer styles or stigmas than there are petals or sepals. Flowers mostly perfect. Stamens and petals generally borne on the calyx, the latter usually withering and persistent. Leaves alternate or opposite.

I. SAXIFRAGE SUBFAMILY. Herbs. Stipules none, or confluent with the base of the petiole. Seeds usually many.

* *Stamens twice the number of the petals or the lobes of the calyx, mostly* 10; *pod commonly* 2*-lobed, beaked, or* 2, *rarely* 3–4, *nearly separate pods.*

\+ *Petals mostly* 5, *entire.*

1. SAXIFRAGA. Flowers in cymes or panicles, or rarely solitary, perfect. Leaves simple or palmately cut. Petals imbricated in the bud. Pod 2-celled below, or 2 (rarely more) separate pistils and pods, many-seeded.
2. ASTILBE. Flowers in spikes or racemes collected in an ample compound panicle, sometimes polygamous or dicœcious. Leaves ample, decompound. Petals small, spatulate, or linear. Little pods 2 or 3, nearly separate, opening down the inner suture, several-seeded.
3. TIARELLA. Flowers in a raceme. Calyx colored (white), 5-parted, and in the sinuses bearing 5 very narrow, slender-clawed petals. Filaments and styles long and slender. Ovary 1-celled, with several ovules towards the base of the 2 parietal placentæ, 2-beaked; one of the beaks or carpels growing much more than the other and making the larger part of the lance-shaped membranaceous pod, which is few-seeded towards the bottom.

\+ \+ *Petals* 5, *pinnatifid, very delicate.*

4. MITELLA. Flowers in a simple raceme or spike, small. Petals colored like the short open calyx (white or green). Stamens short. Styles 2, very short. Ovary and pod globular, 1-celled, with 2 parietal placentæ at the base, many-seeded, opening across the top.

* * *Stamens as many as the petals and alternate with them, usually* 5, *and a cluster of gland-tipped sterile filaments before each petal; stigmas mostly* 4, *directly over as many parietal placentæ.*

5. PARNASSIA. Flower solitary, terminating a scape-like (usually 1-leaved) stem; the leaves mostly from the root, rounded, smooth, and entire. Calyx free from the ovary of 5 sepals. Petals 5, veiny, imbricated in the bud. Styles none. Pod 1-celled, many-seeded.

* * * *Stamens only as many as the petals,* 4 *or* 5; *no sterile filaments; styles* 2 *and alternate with the placentæ or partition.*

6. HEUCHERA. Flowers small, in a long panicle, mostly on a scape. Calyx bell-shaped, the tube cohering below with the 1-celled ovary, and continued beyond it, above 5-cleft, and bearing 5 small, spatulate, erect petals at the sinuses. Styles slender. Pod 1-celled, 2-beaked at the apex, opening between the beaks.

II. Shrubs, with simple leaves (includes plants which have been ranked in 2 or 3 different families). None of the following have stipules, except Ribes. Seeds numerous.

* *Leaves opposite. Calyx tube wholly coherent with the top-shaped or hemispherical ovary, but not at all extended beyond it.*

+ *Stamens only twice as many as the petals,* 8 *or* 10.

7. DEUTZIA. Flowers all alike and perfect, more or less panicled, showy. Lobes of the calyx 5. Petals 5, valvate, with the edges turned inwards. Filaments flat, the 5 alternate ones longer, commonly with a tooth or fork on each side next the top. Styles 3–5, slender. Pod 3–5-celled.

8. HYDRANGEA. Flowers in cymes, commonly of two sorts, the marginal ones (or in high-cultivated plants almost all) enlarged and neutral, consisting of the corolla-like calyx only (Lessons, p. 78, Fig. 214); the others perfect, with a 4–5-toothed calyx, as many small petals valvate in the bud, and twice as many stamens with slender filaments. Styles 2–5, diverging. Ovary 2–5-celled, becoming a small pod which opens at the top between the styles.

+ + *Stamens indefinite,* 20–40.

9. DECUMARIA. Flowers small, in a compound terminal cyme. Calyx minutely 7–10-toothed. Style thick. Petals 7–10, valvate in the bud. Pod small, top-shaped, many-ribbed, bursting at the sides between the ribs.

10. PHILADELPHUS. Flowers showy, often corymbed or panicled. Calyx with 4 or 5 valvate lobes. Petals 4 or 5, broad, convolute in the bud. Styles 3–5, usually somewhat united below. Ovary 3–5-celled, becoming a pod, which splits at length into as many pieces.

* * *Leaves alternate.*

11. ITEA. Leaves pinnately veined, not lobed. Flowers in a raceme. Calyx nearly free from the 2-celled ovary, 5-cleft. Petals lanceolate, much longer than the calyx, and inserted along with the 5 stamens near its base. Pod slender, 2-celled, splitting through the style and the partition.

12. RIBES. Leaves palmately veined and lobed; sometimes with narrow stipules united with the base of the petiole. Calyx with its tube cohering with the ovary, and often extended beyond it, the 5 lobes usually colored like the petals. Petals and stamens each 5, on the throat of the calyx, the former small and mostly erect. Styles 2 or partly united into one; ovary 1-celled with 2 parietal placentæ, in fruit becoming a juicy berry, crowned with the shriveled remains of the rest of the flower.

1. SAXÍFRAGA, SAXIFRAGE. (Latin name, *rock-breaker:* many species rooting in the clefts of rocks.) Besides the following there are a number of rare or local wild species. ♃

* *Leaves all clustered at the root; the naked scape clammy above and bearing many small whitish flowers in a panicle or cyme, the* 2 *ovaries united barely at the base, making at length a pair of nearly separate, divergent pods. Wild species.*

S. Virginiénsis, Michx. Early S. On rocks and moist banks; with obovate or wedge-spatulate, thickish, more or less toothed leaves in an open cluster; scape 3′–9′ high, bearing in early spring white flowers in a dense cluster, which at length opens into a loose panicled cyme; calyx not half the length of the petals; pods turning purple.

S. Pennsylvánica, Linn. Swamp S. In low, wet ground N.; with lance-oblong or oblanceolate obtuse leaves (4′–8′ long), obscurely toothed and narrowed into a very short, broad petiole; scape 1°–2° high, bearing small greenish flowers in an oblong cluster, opening with age into a looser panicle (in spring); the reflexed lobes of the calyx as long as the lance-linear petals.

* * *Leaves clustered; flowers more or less showy; ovaries* 2, *or sometimes* 3–4, *almost separate, becoming as many nearly distinct pods. Exotic species cult. for ornament.*

S. crassifòlia, Linn. THICK-LEAVED S. Cult. from Siberia; very smooth, with fleshy and creeping or prostrate rootstocks, sending up thick, roundish-obovate, nearly evergreen leaves, 6′–9′ long, and scapes (bracted midway) bearing an ample, at first compact cyme of large, bright, rose-colored flowers, in early spring. Sold also as S. SIBÍRICA and S. CUNEIFÒLIA.

S. sarmentòsa, Linn. BEEFSTEAK S., also called STRAWBERRY GERANIUM. Cult. from China and Japan as a house-plant, not quite hardy N.; rather hairy, with rounded heart-shaped or kidney-shaped and doubly toothed leaves of fleshy texture, purple underneath, green-veined or mottled with white above, on shaggy petioles, from their axils sending off slender strawberry-like runners; scapes bearing a light, very open panicle of irregular flowers, with three of the petals small rose-pink and yellow-spotted, and two much longer and nearly white ones lanceolate and hanging.

2. ASTÍLBE. (Name means *not shining.*) Flowers summer. 2ℓ

A. decándra, Don. A tall, rather pubescent herb, 3°–5° high, imitating Spiræa Aruncus in appearance, but coarser; leaflets of the decompound leaves mostly heart-shaped, cut-toothed (2′–4′ long); flowers greenish-white, with petals inconspicuous or absent. Rich woods along the Alleghanies from Va. S.

A. Japónica, Gray (or HOTEÌA JAPÓNICA). Only 1°–2° high, with leaflets of the thrice-ternate leaves lance-ovate or oblong, and crowded white flowers of considerable beauty. Japan.

3. TIARÉLLA, FALSE MITERWORT. (From *tiara*, a turban.) 2ℓ

T. cordifòlia, Linn. Our only species, in rocky woods, especially N.; a low and hairy herb, spreading by summer leafy runners; leaves rounded heart-shaped, sharply lobed and toothed; flowers in a short raceme on a leafless scape, bright white, in spring.

4. MITÉLLA, MITERWORT, BISHOP'S CAP. (Name means *a little mitre*, from the shape of the 2-cleft ovary and young pod.) Delicate plants of moist woods, especially N.; spreading by summer leafy runners or rootstocks; flowers late spring and early summer. 2ℓ

M. diphýlla, Linn. COMMON OR TWO-LEAVED M. Hairy, with rounded heart-shaped and somewhat 3–5-lobed root-leaves on slender petioles, and a pair of opposite, nearly sessile leaves on the scape below the slender raceme of many white flowers.

M. nùda, Linn. NAKED-STALKED M. A delicate little plant, with roundish kidney-shaped doubly crenate leaves, and leafless scape (4′–6′ high) bearing a few greenish blossoms.

5. PARNÁSSIA, GRASS OF PARNASSUS. (Named for *Mt. Parnassus.*) Wild on wet banks; the large white flower handsome, in summer and autumn. 2ℓ

P. Caroliniàna, Michx. The only common species; has the scape or stem 1°–2° high, bearing one clasping leaf low down, and terminated with a flower over 1′ broad, the many-veined petals sessile, with 3 stout, small, sterile filaments before each. Throughout.

P. asarifòlia, Vent. Along the Alleghanies S.; has rather kidney-shaped leaves, and petals narrowed at base into a short claw; otherwise like the first.

6. HEÙCHERA, ALUM ROOT, the rootstock being astringent. (Named for a German botanist, *J. H. Heucher.*) Wild plants of rocky woods; the leaves rounded heart-shaped, and more or less lobed or cut, mostly from the rootstock, often one or two on the tall stalk of the panicle. Flowers mostly greenish, in summer. 2

* *Flowers very small; stamens and styles protruding.*

H. Americàna, Linn. COMMON A. The only one N. and E. of Penn. (also S. to S. Car.); has scapes and loose panicle (2°–3° high) clammy-glandular and often hairy; leaves with rounded lobes, and greenish flowers in early summer.

H. villòsa, Michx. From Md. to Ga. and W., along the upper country; is lower, beset with soft, often rusty hairs; has deeper-lobed leaves, and very small white or whitish flowers, later in summer.

* * *Flowers larger (the calyx fully ¼′ long), in a narrower panicle, greenish, with stamens little if at all protruding; leaves round and slightly 5–9-lobed.*

H. híspida, Pursh. Mountains of Va. and N. C., W. Tall (scape 2°–4° high), usually with spreading hairs; stamens a little protruding.

H. pubéscens, Pursh. Scapes (1°–3° high) and petioles roughish-glandular rather than pubescent; stamens shorter than the lobes of the calyx. From Penn. S.

7. DEÙTZIA. (Named for *Johann Deutz*, a botanist of Amsterdam.) Flowering shrubs, with numerous panicles of white or pinkish blossoms, in late spring and early summer; the lower side of the leaves, the calyx, etc., beset with minute starry clusters of hairs or scurf.

D. grácilis, Sieb. & Zucc. The smaller species, is 2° high, with ovate-lanceolate, sharply serrate leaves, bright green and smooth, and rather small, snow-white flowers, earlier than the next; often forced in greenhouses; filaments forked at the top. Japan.

D. scàbra, Thunb. (or D. CRENÀTA and D. FORTÙNEI). A tall shrub, rough with the fine pubescence, with pale, ovate or oblong-ovate, minutely crenate-serrate leaves, and rather dull white or pinkish blossoms in summer; the filaments broadest upwards and with a blunt lobe on each side just below the anther. China and Japan.

8. HYDRÀNGEA. (Formed of Greek words, *water* and *vase*, in reference to the shape of the capsule.) Flowers summer; often sterile and enlarged, and showy. (Lessons, Fig. 214.)

* *Leaves lobed.*

H. quercifòlia, Bartram. OAK-LEAVED H. Stout shrub, 3°–6° high, very leafy, downy, with oval, 5-lobed, large leaves, and cymes clustered in oblong panicle, with numerous sterile flowers. Wild from Ga. S., hardy N. in cult.

* * *Leaves not lobed.*

– *White-tomentose beneath.*

H. radiàta, Walt. (or H. NÍVEA), has ovate or somewhat heart-shaped, pointed leaves, very white-woolly beneath, but smooth and green above; the flat cyme with a few enlarged sterile flowers round the margin. Wild from S. Car. S. and W., and cult.

+ + *Green, or nearly so, beneath.*

H. arboréscens, Linn. Wild from Penn. and Mo. S., rarely planted; is smooth or nearly so, with ovate or slightly heart-shaped, serrate, pointed leaves; the flat cyme often without any enlarged sterile flowers, but sometimes with a full row round the margin.

H. Horténsia, DC. (and H. Otáksa). Common Greenhouse Hydrangea. Is very smooth, with large and oval, coarsely toothed, bright green glossy leaves, and the flowers of the round flattish cyme nearly all neutral and enlarged, blue, purple, pink, or white. China and Japan.

H. paniculàta, Sieb. Common Outdoor or Hardy Hydrangea. More or less pubescent, at least in the panicle, with oblong-ovate, sharply toothed and long-pointed, dull leaves, which are roughish below, and an elongated panicle of whitish flowers. Japan.

9. DECUMÀRIA. (Name probably meaning that the parts of the flower are in tens, which is only occasionally the case.)

D. bárbara, Linn. Along streams Va. and S.; a tall, mostly smooth shrub, with long branches disposed to climb; ovate or oblong shining leaves, and a compound terminal cyme of small white odorous flowers, in late spring.

10. PHILADÉLPHUS, MOCK ORANGE, SYRINGA. (Name ancient, of no application.) Syringa is the generic name of the Lilac. Ornamental shrubs.

P. coronàrius, Linn. Common Mock Orange. Cult. from S. Eu. Shrub with erect branches, smoothish oblong-ovate leaves, having the taste and smell of cucumbers, and crowded clusters of handsome and odorous cream-white flowers, in late spring.

P. inodòrus, Linn. Scentless M. Wild in upper districts S.; shrub, smooth, with spreading, slender branches, mostly entire, ovate-oblong leaves; rather small flowers scattered at the end of the diverging branchlets, and calyx-lobes not longer than the ovary.

P. grandiflòrus, Willd. Large-fl. M. Wild along streams from Va. S., and planted in several varieties; tall shrub, with long recurving branches, ovate and pointed, usually toothed, smoothish, or slightly downy leaves, and very large, pure white, scentless flowers, in early summer, either single or in loose clusters at the end of the branches, the slender-pointed calyx lobes much longer than the ovary.

Var. *floribúndus*, Torr. & Gray (or P. latifòlius). Robust, 6°–12° high, with the ovate and toothed, 5-ribbed leaves hairy beneath, and large, pure white and nearly scentless flowers clustered, in early summer. Cult.

P. Gordoniànus, Lindl. From Ore.; is very tall, with ovate-acuminate serrate leaves, the flowers very slightly scented and numerous, in 5–9-flowered racemes, in midsummer, 10 days or more later than other kinds.

P. hirsùtus, Nutt. Hairy M. Wild in N. Car. and Tenn., and cult.; slender, with recurving branches, the small, ovate and acute, sharply-toothed leaves hairy, and beneath even hoary; the small white flowers solitary or 2–3 together at the end of short racemose side branchlets.

11. ÌTEA. (Greek name of *Willow.*)

I. Virgínica, Linn. A tall shrub, with oblong, pointed, and serrulate leaves, and racemes of pretty white flowers, in early summer. Low places, Penn., S. and W.

12. RÌBES, CURRANT, GOOSEBERRY. (Name of uncertain origin.)
Low shrubs; flowers spring; fruit mostly edible.

§ 1. Gooseberry. *Stems commonly with 1 or 2 thorns below the leaf-stalks or the clusters of leaves, often with numerous scattered prickles besides, these sometimes on the berry also.*

* *Flowers 1–3 in a cluster.*

+– *Flowers red and showy.*

R. speciòsum, Pursh. Showy Flowering Gooseberry, of Cal. Somewhat cult. for ornament; has small and shining leaves; very handsome flowers on a hanging peduncle, the short-tubular calyx, petals, and long-projecting stamens deep red, so that the blossom resembles that of a Fuchsia; berry prickly, few-seeded.

+– +– *Flowers small and greenish.*

+– *Calyx lobes shorter than the tube.*

R. Cynósbati, Linn. Has bluntly 3-lobed downy leaves, with slender peduncles, stamens and undivided style not exceeding the broad calyx, and large prickly (or rarely smooth) dull purple berry. Common N.

+– +– *Calyx lobes conspicuously longer than the tube.*

R. Grossulària, Linn. European Gooseberry, but more or less cult. here in several varieties, as Industry, Crown Bob, etc., is a stocky bush with thickish leaves, a pubescent ovary and calyx, and a large, usually finely pubescent fruit.

R. oxyacanthoìdes, Linn. Parent of the American Gooseberries, like Houghton and Downing, is seldom downy, with thinner leaves, very short thorns or none; very short peduncles; stamens and 2-cleft style scarcely longer than the bell-shaped, smooth calyx; ovary and berry smooth, the latter medium-sized, either green or reddish when ripe. New Eng. to N. J., W.

R. rotundifòlium, Michx. Often downy-leaved; peduncles rather slender; the slender stamens and 2-parted style longer than the narrow calyx; berry smooth. Mass. and N. Y., S.

* * *Flowers several, in a nodding raceme.*

R. lacústre, Poir. Lake or Swamp G. Cold bogs and wet woods N.; low, with 3–5-parted heart-shaped leaves, their lobes deeply cut; very small flowers with broad and flat calyx; short stamens and style, and small bristly berries of unpleasant flavor.

§ 2. Currant. *No thorns or prickles, and the flowers numerous in the racemes.*

* *Flowers greenish or whitish, small.*

+– *Leaves without resinous dots; calyx flat and open; berries red (or white).*

R. prostràtum, L'Her. Fetid Currant. Cold woods N.; with reclining stems; deeply heart-shaped and acutely 5–7-lobed leaves; erect racemes; pedicels and pale-red berries glandular-bristly; these and the bruised herbage exhale an unpleasant, skunk-like odor.

R. ràbrum, Linn. Garden Currant. Cult. from Eu., with straggling or reclining stems, somewhat heart-shaped moderately 3–5-lobed leaves; the lobes roundish, and drooping racemes from lateral buds distinct from the leaf buds; edible berries red, or white; also a striped variety.

Var. **subglandulòsum**, Maxim., a native form in cold swamps N., has the racemes clustered below the leafy tips of the canes.

+- +- *Leaves sprinkled with resinous dots; flowers larger, with oblong-bell-shaped calyx; berries larger, black, aromatic and spicy, glandular-dotted.*

R. flóridum, L'Her. Wild Black C. Woods N.; leaves slightly heart-shaped, sharply 3–5-lobed and doubly serrate; racemes drooping, downy, bearing many whitish flowers, with conspicuous bracts longer than the pedicels.

R. nìgrum, Linn. Garden Black C. Cult. from Eu.; much like the preceding, but has greener and fewer flowers in the raceme, minute bracts, and a shorter calyx.

* * *Flowers highly colored (red or yellow), much larger.*

R. sanguíneum, Pursh. Red-flowered C. From Ore. and Cal.; glandular and somewhat clammy, with 3–5-lobed leaves whitish-downy beneath, nodding racemes of rose-red flowers, the calyx tube oblong-bell-shaped, the berries glandular and insipid.

R. Gordoniànum is supposed to be a hybrid between this and the next.

R. aùreum, Pursh. Golden, Buffalo, Missouri or Crandall Currant. From Mo. to Ore.; abundantly cult. for its spicy-scented bright-yellow flowers in early spring; smooth, with rounded 3-lobed and cut-toothed leaves (which are rolled up in the bud), short racemes with leafy bracts, and tube of the yellow calyx very much longer than the spreading lobes; the berries blackish, usually insipid.

XL. CRASSULACEÆ, ORPINE FAMILY.

Succulent plants, differing from the Saxifrage Family mainly in the complete symmetry of the flowers, the sepals, petals, stamens, and pistils equal in number, or the stamens of just double the number; the pistils all separate and forming as many (mostly many-seeded) little pods, except in Penthorum, where they are united together. (Lessons, p. 81, Figs. 222–225.) Penthorum, which is not succulent, is intermediate between this family and the foregoing. Several are somewhat monopetalous.

§ 1. *Leaves not at all fleshy, but thin and membranaceous; the 5 ovaries united into one 5-horned 5-celled pod; no scales behind the ovaries.*

1. PENTHORUM. Sepals 5. Petals 5, small, or usually none. Stamens 10. Pod opening by the falling away of the 5 beaks, many-seeded. Rarely the parts are in sixes or sevens.

§ 2. *Leaves thickened and succulent; ovaries separate, a minute scale behind each.*

* *Petals separate; sepals nearly so or united at the base.*

2. SEMPERVIVUM. Sepals, narrow petals, and pistils 6–12 or even more, and stamens twice as many. Plants usually multiplying by leafy offsets, on which the leaves are crowded in close tufts like rosettes.

3. SEDUM. Sepals, narrow petals, and pistils 4 or 5; the stamens twice as many, the alternate ones commonly adhering to the base of each petal.

4. CRASSULA. Sepals or lobes of the calyx, petals, stamens, and many-seeded pistils 5. Perennial herbs or fleshy-shrubby plants, with flowers in cymes or clusters.

* *Petals united by their edges below, and bearing the stamens.*

\+ *Calyx* 5*-cleft or* 5*-parted; pistils* 5.

5. ROCHEA. Corolla salver-form, longer than the calyx. Stamens 5.
6. COTYLEDON. Corolla urn-shaped, bell-shaped, or cylindrical, sometimes 5-angled. Stamens 10.

\+ \+ *Calyx and corolla both* 4*-lobed at summit; pistils* 4.

7. BRYOPHYLLUM. Calyx inflated, shortly 4-toothed, the lobes of the corolla at length projecting and spreading. Stamens 8, projecting on slender filaments. Leaves opposite, petioled, simple or odd-pinnate, crenate.

1. PÉNTHORUM, DITCH STONECROP. (Name from Greek, alluding to the parts of the flower being in fives.) ♃

P. sedoìdes, Linn. Wet places, especially by roadsides; a homely weed, about 1° high, with alternate lanceolate and serrate leaves, and yellowish-green inconspicuous flowers loosely spiked on the upper side of the branches of an open cyme, all summer and autumn.

2. SEMPERVÌVUM, HOUSELEEK. (Latin for *live-forever.*) ♃

S. tectòrum, Linn. COMMON HOUSELEEK, HEN-AND-CHICKENS, ADAM-AND-EVE, OLD-MAN-AND-WOMAN. Propagating abundantly by offsets on short and thick runners; leaves of the dense clusters oval or obovate, smooth except the margins, mucronate; those on the flowering stems scattered, oblong, clammy-pubescent, as well as the clustered purplish or greenish flowers; sepals, petals, and pods mostly 12. Cult. in country gardens, and used for carpet bedding; rarely flowering, in summer. The common country names refer to the companionship of the plants due to their method of propagation. (Lessons, Figs. 91, 191.)

3. SÈDUM, STONECROP, ORPINE. (From Latin *sedeo*, sit, i.e. upon rocks, walls, etc.) The following are all smooth perennials, and hardy N., except the first species. Many others are cult., but are not common.

§ 1. *Leaves flat and broad, oblong, obovate, or rounded.*

* *The lower ones, at least, whorled in threes.*

S. Siebòldii, Sweet. SIEBOLD'S S. Cult. from Japan, mostly in pots; with slender and weak or spreading stems, glaucous and mostly reddish-tinged, round, and often concave leaves (1′ or less long), with a wedge-shaped base, and wavy-toothed margin, all in whorls up to the cyme of rosy-purple flowers, which all have their parts in fives.

S. ternàtum, Michx. THREE-LEAVED S. Wild in rocky woods from N. Y., S. and W., and in gardens; with spreading stems creeping at base and rising 3′–6′ when they blossom; the lower leaves wedge-obovate and whorled; the upper oblong and mostly scattered, about ½′ long; flowers white, the first or central one with parts generally in fives, the others sessile along the upper side of the usually 3 spreading branches and mostly with their parts in fours; in late spring.

* * *All or most of the leaves alternate; flowers in a corymb-like, terminal cyme, purple or purplish, in summer; all with their parts in fives.*

S. Telèphium, Linn. GARDEN ORPINE or LIVE-FOREVER. Cult. from Eu. in old country gardens; erect, about 2° high, with oval and mostly wavy-toothed, pale, and thick leaves; small and dull-colored flowers in a compound cyme, and short-pointed pods. Becoming a weed E.

S. telephioìdes, Michx. Wild O. or L. Dry rocks on mountains, chiefly along the Alleghanies; 6′–12′ high, very like the last, but with fewer flowers, and pods tapering into a slender style.

§ 2. *Leaves narrow and thick, barely flattish or terete; low or creeping plants.*

S. àcre, Mossy S., or Wall Pepper. Cult. from Eu., for edgings and rock work, running wild in some places; a moss-like little plant, forming mats on the ground, yellowish-green, with very succulent and thick, ovate, small, and crowded leaves, and yellow flowers in summer, their parts in fives.

S. pulchéllum, Michx. Beautiful S. Wild S. W. on rocks; also cult. in gardens; spreading and rooting stems, 4′–12′ long; leaves crowded, terete, linear-thread-shaped; flowers rose-purple, crowded on the upper side of the 4 or 5 spreading branches of the cyme, their parts mostly in fours, while those of the central or earliest flower are in fives; in summer.

S. sarmentòsum, Bunge. (Known in gardens as S. cárneum, var. variegàtum.) Cult. in borders, and for carpet bedding; has creeping pink stems, and the small leaves mostly opposite, sometimes in threes, linear, flattish, acute, very pale green, and white-edged; flowers yellow. China.

4. CRÁSSULA. (So named from the incrassated or thick leaves.) House-plants, occasionally cult., from Cape of Good Hope. ♃

C. arboréscens, Willd. Fleshy shrub, with glaucous roundish-obovate leaves (2′ long) tapering to a narrow base, and dotted on the upper face; the flowers rather large and rose-colored.

C. lácteа, Soland. Has greener and narrower-obovate leaves, connate at the base in pairs, and a panicle of smaller white flowers.

C. falcàta, Wendl. Has slightly woody stems, oblong and rather falcate or curved leaves connate at base, 3′–4′ long, powdery-glaucous, and a compound cyme of many red sweet-scented flowers, the petals with erect claws partly united below, and spreading abruptly above.

5. RÒCHEA. (Named for a Swiss physician, *Laroche*.) Half-shrubby succulent house-plants of the Cape of Good Hope. ♃

R. coccínea, DC. Stems 1°–2° high, thickly beset with the oblong-ovate (1′ long) leaves up to the terminal and umbel-like, sessile cluster of handsome flowers; tube of the scarlet-red corolla, 1′ long.

6. COTYLÈDON. (From Greek word for a *shallow cup*.) House-plants, not common. ♃ Many species are cult.

C. orbiculàta, Linn. Half-shrubby, succulent plant, from Cape of Good Hope, with opposite white-powdery or glaucous wedge-obovate leaves (2′–4′ long), and a cluster of showy red flowers (nearly 1′ long) raised on a slender naked petiole, the cylindraceous tube of the corolla longer than the recurved lobes.

C. (or *Echevèria*) *coccínea*, Cav. From Mex.; is shrubby at base, with the wedge-obovate, acute leaves in rosettes, and alternate and scattered on the flowering stems; flowers in a leafy spike, the 5-parted corolla not longer than the spreading calyx, 5-angled at base, red outside, yellow within.

7. BRYOPHÝLLUM. (Name of Greek words for *sprout* or *bud* and *leaf*.) ♃

B. calycìnum, Salisb. A scarcely shrubby, succulent plant, probably from Mex., cult. in houses; with opposite petioled leaves, 3 or 5 pinnate

leaflets, or the upper of single leaflets, and an open panicle of large and rather handsome, hanging green flowers, tinged with purple; the calyx is oblong and bladdery; out of it the tubular corolla at length projects, and has 4 slightly spreading acute lobes; the leaflets oval, 2′–3′ long, crenate; when laid on the soil, or kept in a moist place, they root and bud at the notches, and produce little plants.

XLI. DROSERACEÆ, SUNDEW FAMILY.

Bog-herbs, with regular flowers, on scapes; leaves in a tuft at the root, glandular-bristly or bristly-fringed, and rolled up from the apex in the bud, in the manner of Ferns; the persistent sepals and withering-persistent petals each 5; stamens 5–15, with their anthers turned outward; and a 1-celled many-seeded pod. Represented here by two genera of insectivorous plants. (See Lessons, p. 154.)

1. DROSERA. Stamens 5. Styles 3–5, but 2-parted, so as to seem like 6–10. Ovary with 3 (rarely 5) parietal placentæ. Reddish-colored and sticky-glandular.
2. DIONÆA. Stamens 15. Style 1; stigma lobed and fringed. Ovules and seeds all at the broad base of the ovary and pod. Leaves terminated by a bristly-bordered fly-trap.

1. DRÓSERA, SUNDEW. (Name means in Greek *dewy*, the gland surmounting the bristles of the leaves producing a clear and dew-like drop of liquid, which is glutinous, and serves to catch small insects.) Flowers small, in a 1-sided spike or raceme, each opening only once, in sunshine, in summer. 2ℓ

* *Flowers small, white; leaves with a blade.*

D. rotundifòlia, Linn. ROUND-LEAVED S. The commonest species in peat bogs; with round leaves on long, hairy petioles, spreading in a tuft. When a small fly or other insect is caught by the sticky glands on the upper face of the leaf, the bristles of the outer rows very slowly turn inwards, so that their glands help to hold the prey.

D. intermèdia, Hayne, var. **Americàna**, DC. In very wet bogs or shallow water N.; has spatulate-oblong leaves on naked petioles, some of them erect.

D. brevifòlia, Pursh. SHORT-LEAVED S. Small; scape only 2′–5′ high, few-flowered; leaves short, wedge-shaped. In wet sand, only at the S.

* * *Flowers rose-purple; no blade to the leaf.*

D. filifórmis, Raf. THREAD-LEAVED S. Leaves erect, thread-shaped; scape 6′–12′ high, from a bulb-like base; flowers handsome, ½′ or more broad. In wet sandy soil near the coast, from Plymouth, Mass., to Fla.

2. DIONÆA, VENUS'S FLYTRAP. (Named for the mother of Venus.) 2ℓ Only one species.

D. muscípula, Ellis. Grows in sandy bogs in N. and S. Car., but kept in conservatories as a curiosity. (Lessons, Figs. 176, 492.) Flowers white, borne in an umbel-like cyme on a scape 1° high, in spring.

XLII. HAMAMELIDEÆ, WITCH-HAZEL FAMILY

Shrubs or trees, with alternate simple leaves, deciduous stipules, small flowers in heads, spikes, or little clusters, the calyx united below with the base of the 2-styled ovary, which forms a hard or woody 2-celled and 2-beaked pod, opening at the summit. Stamens and petals inserted on the calyx.

§ 1. *Shrubs, with perfect or merely polygamous flowers, a regular calyx, and a single ovule, becoming a bony seed, suspended from the top of each cell.*

1. HAMAMELIS. Flowers in small clusters in the axils of the leaves, expanding late in autumn, ripening the seeds the next summer. Calyx 4-parted. Petals 4, strap-shaped. Stamens 8, very short; the 4 alternate with the petals bearing anthers, the 4 opposite them imperfect and scale-like. Styles short. Pod with an outer coat separating from the inner.

2. FOTHERGILLA. Flowers in a scaly-bracted spike, in spring, rather earlier than the leaves. Calyx bell-shaped, slightly 5-7-toothed. Petals none. Stamens about 24, rather showy, the long and club-shaped filaments bright white. Styles slender. Pod hairy.

§ 2. *Tree, with monœcious small flowers, in dense heads or clusters, destitute both of calyx and corolla, the fertile with many ovules in each cell, but only one or two ripening into scale-like seeds.*

3. LIQUIDAMBAR. Heads of flowers each with a deciduous involucre of 4 bracts, the sterile in a conical cluster, consisting of numerous short stamens with little scales intermixed; the fertile loosely racemed or spiked on a drooping peduncle, composed of many ovaries (surrounded by some little scales), each with 2 awl-shaped beaks, all cohering together and hardening in fruit.

1. HAMAMÈLIS, WITCH-HAZEL. (An old Greek name.)

H. Virginiàna, Linn. Tall shrub, of damp woods, with the leaves obovate or oval, wavy-toothed, straight-veined like a Hazel, slightly downy; the yellow flowers remarkable for their appearance late in autumn, just as the leaves are turning and about to fall. Seeds ripening the following year, and forcibly ejected from the capsule through hygroscopic action.

2. FOTHERGÍLLA. (Named for *Dr. Fothergill* of London, an early botanist.)

F. Gardèni, Linn. Low, rather ornamental shrub, in swamps, from Va. S., with oval or obovate, straight-veined leaves, toothed at the summit and often hoary beneath, the white flowers in spring.

3. LIQUIDÁMBAR, SWEET GUM TREE or BILSTED. (Names allude to the fragrant juice or balsam which exudes from the trunk.)

L. Styracíflua, Linn. The only species of this country; a large and beautiful tree in low grounds, from S. N. Eng. to Ill., and especially S., with fine-grained wood, gray bark forming corky ridges on the branches, and smooth and glossy, deeply 5–7-lobed leaves, which are fragrant when bruised, changing to deep crimson in autumn, their triangular lobes pointed and beset with glandular teeth; greenish flowers appearing with the leaves in early spring. Cult.

XLIII. HALORAGEÆ, WATER MILFOIL FAMILY.

Contains a few insignificant aquatic or marsh plants, with very small greenish flowers, sessile in the axils of the (often whorled) leaves or bracts, a single ovule and seed suspended in each of the 1–4 cells of the ovary, and 1–8 stamens; all of them too obscure and unimportant for record here. The species are fully treated in the Manual.

XLIV. MYRTACEÆ, MYRTLE FAMILY.

Trees or shrubs, with simple, entire, and mostly aromatic leaves, punctate with pellucid or resinous dots, no stipules, perfect flowers, calyx-tube adherent to the ovary, its throat, or a disk bordering it, bearing the petals and numerous stamens; style and stigma single. A large family in the tropics and southern hemisphere, here commonly known only by a few house-plants, or grown for fruit or ornament far S., which may be briefly noted as follows: —

1. *Mỹrtus communis*, Linn. Common Myrtle. From the Mediterranean region; smooth, with ovate or lance-ovate, opposite, shining leaves, small in the variety usually cultivated; peduncles in their axils bearing a small white or rose-tinged flower (sometimes full double), followed by a black berry, containing several kidney-shaped seeds.

2. *Eugènia Jámbos*, Linn. Rose Apple. From India; smooth, with opposite, shining, long, and lanceolate leaves, and clusters of large white flowers, with their long stamens most conspicuous; the calyx tube dilated and prolonged beyond the ovary, which forms a large edible berry, like a small apple, scentless, but when eaten, of a rose-like savor; seeds very few, large.

3. *Psídium Guyàva*, Linn. Guava. With oval, feather-veined, opposite leaves, pubescent beneath, and one or two white flowers at the end of an axillary peduncle; the fruit a large and pear-shaped yellowish berry, which is edible, and from which *Guava jelly* is made in the West Indies. The White, Pear, and Apple Guavas are of this species. P. pomíferum and P. pyríferum are forms of this species. The plant is probably native to tropical America, although now widely distributed.

P. Cattleiànum, Sabine. Cattley Guava. Has obovate, and thick, and shining leaves, and a small reddish fruit, which lacks the muskiness of the common sorts.

4. *Callistèmon lanceolàtus*, Sweet. Of Australia, called Bottle Brush, on account of the appearance of the flowers (sessile all round the stem below the later leaves) with their very long, deep red stamens; the 5 petals small and falling early; the fruit a small, many-seeded pod, opening at the top; the alternate lanceolate leaves remarkable for being turned edgewise by a twist at their base, as in many related Myrtaceous plants of Australia.

XLV. MELASTOMACEÆ, MELASTOMA FAMILY.

Plants with opposite and simple 3–7-ribbed leaves, no stipules, as many or twice as many stamens as petals, both inserted in the throat of the calyx, anthers usually of peculiar shape, and opening by a small hole at the apex. Flowers usually handsome, but mostly scentless. None in common cultivation.

1. **RHÉXIA**, DEERGRASS, MEADOW BEAUTY. (Name Greek, application obscure.) Low, erect herbs of wet or sandy ground, commoner S., often bristly, at least on the margins of the sessile (or nearly so) 3–5-ribbed leaves, with handsome flowers in a terminal cyme or panicle. Tube of the calyx urn-shaped, adherent to the lower part of the 4-celled ovary and continued beyond it into a short 4-toothed cup, persistent; petals 4, obovate; stamens 8, with anthers opening by a single, minute hole; style slender; stigma simple; seeds numerous in the pod, coiled like minute snail shells. Flowers summer. ♃

* *Anthers linear and curved, with a sac-like base and usually a minute spur; flowers in a panicle or loose cyme, peduncled.*

R. Virgínica, Linn. The common species N. in sandy swamps; 6′–20′ high, with square stem almost winged at the angles; ovate or lance-oval leaves, gland, tipped hairs, and large, pink-purple flowers.

R. aristòsa, Britt. Branches more or less wing-angled; leaves linear-oblong, not narrowed at base, the hairs few and not glandular; flowers bright purple; the petals sparsely villous. N. J. to S. Car.

R. Mariàna, Linn. 10′–24′ high, with terete or 6-angled, branching stem; linear or lance-oblong leaves narrowed at base, and pale purple flowers hairy outside. N. J. and Ky., S.

R. glabélla, Michx. Smooth, with a simple slender stem, lanceolate, glaucous leaves, and large bright purple flowers. Pine barrens S.

R. stricta, Pursh. Stem tall and smooth, 4-winged, hairy at the joints; leaves lanceolate or nearly so and acute, 5-ribbed, bristly-serrate; flowers purple in a compound cyme, the calyx smooth and urn-shaped with lanceolate lobes. Pine barrens, Ga., S. and W.

* * *Anthers oblong and straight, destitute of any appendage.*

+ *Flowers purple, few or solitary; leaves small (rarely 1′ long), rounded-ovate, ciliate with long bristles; stem square, smooth.*

R. ciliòsa, Michx. Stem 10′–12′ high; leaves bristly on the upper face; and calyx smooth. Bogs in pine barrens from Md., S.

R. serrulàta, Nutt. Stem 3′–6′ high; leaves smooth above; calyx bristly. Bog in pine barrens, Ga. and S.

+ + *Flowers yellow, small, numerous, not casting the petals early, as do the others; stem 4-angled, bristly, bushy branched above.*

R. lùtea, Walter. Stem 1° high, bristly; leaves lanceolate, or the lower obovate, bristly-serrulate but smooth, acute; calyx smooth. N. Car., S. and W.

XLVI. LYTHRACEÆ, LOOSESTRIFE FAMILY.

Trees or herbs with the 1–4-celled, many-seeded ovary and pod usually free from, but mostly inclosed in, the tube of the calyx, the leaves not punctate, mostly opposite and entire, the stamens on the throat of the calyx, with anthers opening lengthwise. Flowers perfect, often dimorphous or trimorphous. To this family is now appended the Pomegranate, which, although peculiar, is nearer to this than to the Myrtle Family, to which it is often referred.

§ 1. *Ovary coherent with the calyx tube, becoming a fleshy fruit. Small tree.*

1. PUNICA. Calyx tube colored (scarlet), thick and coriaceous, its top-shaped base coherent with the ovary, above enlarged and 5–7-lobed; its throat bearing the 5–7 petals and very many incurved stamens. Style slender. Ovary with many cells in two sets, one above the other, and very many ovules in each. Fruit large, globular, crowned with the calyx lobes, berry-like, but with a hard rind; the numerous seeds coated with a juicy edible pulp.

§ 2. *Ovary free from the calyx tube, becoming a 1–6-celled pod.*

* *Stamens indefinitely numerous. Small tree.*

2. LAGERSTRŒMIA. Calyx 6-lobed. Petals 6, very wavy-crisped, raised on slender claws, borne on the throat of the calyx. Stamens borne in the bottom of the calyx, very long and slender, 6 outermost larger than the rest. Style very slender. Pod oblong, thick, many-seeded, 3–6-celled, only the base covered by the persistent calyx.

* * *Stamens 4–16, only as many or twice as many as the lobes of the calyx, inserted lower down than the petals. Herbs or nearly so; calyx mostly with projecting folds, or accessory teeth between the proper teeth or lobes.*

\+ *Flowers regular or nearly so; pod many-seeded, included in the calyx.*

\+\+ *Stamens 4.*

3. ROTALA. Calyx short, bell-shaped, or nearly globose, with tooth-like appendages at the sinuses. Stamens short. Petals 4. Capsule globular and 4-celled, septicidal. Leaves (in ours) opposite.

4. AMMANNIA. Calyx short, 4-angled, generally with a horn-like appendage at each sinus. Petals 4 and small, or none. Pod globular, 2–4-celled, opening irregularly. Leaves opposite, narrow.

\+\+\+ *Stamens more than 4.*

5. LYTHRUM. Calyx cylindrical, 8–12-ribbed or striate, with a minute appendage in each sinus. Petals 5–7, mostly 6. Stamens 5–14. Style slender. Pod oblong, 2-celled. Leaves sessile.

6. DECODON. Calyx short, bell-shaped, or hemispherical, with prominent projections between the teeth. Stamens 8 or 10 (rarely more), twice as many as the petals, in 2 sets, with long projecting filaments. Style slender. Pod globular, 3–5-celled. Leaves mostly whorled in threes, or opposite. Flowers trimorphous.

\+ \+ *Flowers irregular; pod mostly few-seeded.*

7. CUPHEA. Calyx elongated, mostly many-ribbed, gibbous, spurred, or with a sac-like projection at base on the upper side, oblique at the mouth, which has 6 proper teeth, and usually as many intermediate accessory ones or processes. Petals mostly 6, with claws, and very unequal, the two upper ones larger; sometimes all or part wanting. Stamens 11 or 12, unequal. Ovary flat, 2-celled, but one cell smaller and sterile or empty. Pod inclosed in the calyx, and bursting through it on the lower side.

1. PÙNICA, POMEGRANATE. (The name means *Carthaginian.*)

P. Granàtum, Linn. Tree cult. from the Orient as a house plant N. and for its fruit S.; smooth, with small oblong or obovate obtuse leaves, either opposite or scattered, mostly clustered on short branchlets; the flowers short-stalked, usually solitary, large, both calyx and corolla bright scarlet, with 5–7 petals, or full double; the seedy fruit as large as a small apple.

2. LAGERSTRŒ̀MIA, CRAPE MYRTLE. (Named for a Swedish naturalist, *Lagerstræm.*)

L. Índica, Linn., from E. Indies; planted for ornament from Washington, S., and in conservatories N.; shrub with smooth, ovate or oval opposite, leaves, and panicles of very showy pale rose or flesh-colored large flowers, remarkable for the wavy-crisped petals and long silky-tufted stamens.

3. ROTÀLA. (*Wheel-shaped.*) One inconspicuous marsh herb in our region. ①

R. ramòsior, Koehne. Plant 3'–8' high, with narrow leaves tapering to the base; very small, sessile flowers in the axils, solitary or rarely 3 together. Mass. to Fla. and W.

4. AMMÁNNIA. (Named for *Paul Ammann*, an early German botanist.) Low insignificant herbs in wet places S., with small, greenish flowers in the axils of the narrow leaves. ①

A. coccínea, Rottb. Leaves linear-lanceolate, with an auricled base; flowers in dense subsessile axillary cymes. N. J. to Fla. and W.

5. LÝTHRUM, LOOSESTRIFE. (Name in Greek for *blood;* application obscure.) Flowers summer.

* *Flowers small and few; stamens 7 or less.*

L. Hyssopifòlia, Linn. Leaves small and narrow, obtuse, longer than the very small, pale purple flowers; stamens 4–6 included. Low (6'–10'), in marshes from Me. to N. J. ①

L. alàtum, Pursh. Low grounds W. and S.; nearly smooth, slender, 2°–3° high, above and on the branches with margined angles, very leafy; the small leaves oblong, the uppermost not longer than the small flowers in their axils; petals 6, purple; stamens 6, in some flowers exserted. 2

* * *Flowers showy, in spicate clusters; stamens 8 or more.*

L. Salicària, Linn. Spiked L. With stems 2°–3° high; leaves broad-lanceolate, and often with a heart-shaped base, in pairs or threes; flowers crowded in their axils and forming a wand-like spike, rather large, with 6 or rarely 7 lance-oblong pink petals, and twice as many stamens of two lengths. Sparingly wild N. E. in wet meadows, and cult; Eu. 2

6. DÉCODON. (Name from Greek for *ten-toothed.*) 2

D. verticillàtus, Ell. Common E. and S. in very wet places; smooth or minutely downy, with long, recurving branches (2°–8° long), lanceolate leaves, mostly in threes, the upper with clustered, short-stalked flowers in their axils, 5 wedge-lanceolate rose-purple petals, and 10 stamens of two or three lengths.

7. CÙPHEA. (Name from Greek, means *gibbous* or *curved*, from the shape of the calyx.) Leaves chiefly opposite; flowers all summer.

* *Annuals.*

C. viscosíssima, Jacq. CLAMMY C. Sandy fields from Conn. to Ill. and S.; a rather homely herb, 1°–2° high, branching, clammy-hairy, with lance-ovate leaves; small flowers somewhat racemed along the branches and ovate pink petals on short claws.

C. lanceolàta, DRYAND (or C. SILENOÌDES). Cult. from Mexico; clammy-hairy, 1° high, with lance-oblong or lanceolate leaves tapering at base into short petiole, and rather large flowers, some racemed on the branches; calyx purplish, almost 1′ long, ovoid at base and with a tapering neck; petals blood-purple or crimson, rounded, the 2 larger ½′ in diameter.

* * *Perennials, more or less woody at base.*

C. hyssopifòlia, HBK. A diffuse plant usually grown in pots, with small and linear-oblong spreading leaves, and solitary, little, pinkish flowers which, including the slender pedicels, are scarcely longer than the leaves. Mex.

C. ìgnea, DC. (or C. PLATYCÉNTRA). Cult. from Mexico, both in greenhouses and for borders, flowering through the season; slightly woody at base, 8′–12′ high, forming masses, thickly beset with the ovate or lance-ovate acute, smooth, and glossy bright green leaves, with bright vermilion flowers between each pair, the calyx narrow and tubular, almost 1′ long, with a short and very blunt spur at base, the short border and teeth dark violet edged on the upper side with white; petals none.

XLVII. ONAGRACEÆ, EVENING PRIMROSE FAMILY.

Herbs, or sometimes shrubs, generally without stipules; the parts of the perfect and symmetrical flowers in fours (rarely in two to sixes) throughout; the tube of the calyx usually prolonged more or less beyond the adherent ovary, its lobes valvate in the bud, its throat bearing the petals (convolute in the bud), and as many or twice as many stamens; styles always united into one. Embryo filling the seed; no albumen. Comprises many plants with showy blossoms. (Lopezia has irregular flowers with only one perfect stamen.)

* *Capsule dry and dehiscent, 2–6-celled, and the cells ∞-seeded.*

+ *Seeds comose: i.e. furnished with a tuft of long and soft hairs at one end.*

1. EPILOBIUM. Calyx with tube scarcely at all extended beyond the linear ovary. Petals 4. Stamens 8.
2. ZAUSCHNERIA. Calyx extended much beyond the linear ovary into a funnel-shaped tube, with an abruptly inflated base where it joins the ovary, and with 4 lobes as long as the 4 oblong-obcordate petals, both of bright scarlet color. Stamens 8 and, as well as the long style, projecting.

+ + *Seeds naked, i.e. without a downy tuft.*

++ *Flowers regular and symmetrical, but often without petals; the calyx tube not extended beyond the broad summit of the ovary, on which the green lobes mostly persist; style usually short; stigma capitate.*

3. JUSSIÆA. Stamens twice as many as the lobes of the calyx, petals, and cells of the pod; i.e. 8 or 10, rarely 12.

4. LUDWIGIA. Stamens as many as the lobes of the calyx and cells of the pod, almost always 4. Petals 4, often small, or none.
5. CLARKIA. Calyx tube barely continued beyond the ovary into a very short, funnel-form cup. Petals broad, wedge-shaped or rhombic, sometimes 3-lobed, raised on a slender claw. Stamens 8, with slender filaments, the alternate ones shorter; anthers curved or coiled after opening, those of the short stamens much smaller, or deformed and sterile. Stigmas 4, oval or oblong. Pod linear and tapering upwards, 4-sided. Flowers never yellow.

++ ++ *Flowers regular and symmetrical; calyx tube extended more or less beyond the ovary, the lobes mostly reflexed; petals* 4.

6. EUCHARIDIUM. Calyx tube much prolonged and slender beyond the ovary. Petals wedge-shaped and 3-lobed at summit, tapering into a short claw. Stamens only 4, on slender filaments. Stigmas 2 or 4. Pod oblong-linear. Seeds slightly wing-margined. Flowers never yellow.
7. ŒNOTHERA. Calyx tube generally much prolonged beyond the ovary. Petals usually obovate or obcordate, with hardly any claw. Stigmas 4, long and slender (rarely discoid). Stamens 8. Flowers yellow or white, or rose-red.
8. GODETIA. Calyx tube beyond the linear or spindle-shaped ovary, inversely conical or funnel-shaped. Flowers open by day, scentless. Petals broad and fan-shaped or wedge-shaped, the truncate summit generally eroded, lilac-purple, rose-color, or sometimes white. Stigma with 4 linear or short and broad lobes. Anthers erect (stamens 8) on short (the alternate ones on very short) and broadish filaments, curving after opening.

++ ++ ++ *Flowers irregular and unsymmetrical; calyx tube not extended.*

9. LOPEZIA. Flowers small. Calyx with 4 linear purplish lobes. Petals with claws, 4, turned towards the upper side of the flower, the two uppermost narrower and with a callous gland on the summit of the claw, and what seems to be a fifth small one (but is a sterile stamen transformed into a petal) stands before the lower lobe of the calyx. Fertile stamen only one with an oblong anther. Style slender; stigma entire. Pod globular.

* * *Fruit a berry,* 4*-celled.*

10. FUCHSIA. Flowers showy; the tube of the highly colored calyx extended much beyond the ovary, bell-shaped, funnel-shaped, or tubular, the 4 lobes spreading. Petals 4. Stamens 8. Style long and thread-shaped; stigma club-shaped or capitate.

* * * *Capsule indehiscent,* 1*-4-celled, the cells generally* 1*-seeded.*

\+ *Parts of the flower in twos.*

11. CIRCÆA. Delicate low herbs, with opposite thin leaves, and very small whitish flowers in racemes. Calyx with 2 reflexed lobes, its tube slightly prolonged beyond the 1–2-celled ovary, which becomes a 1–2-seeded little bur-like fruit, covered with weak hooked bristles. Petals 2, obcordate. Stamens 2. Style slender, tipped with a capitate stigma.

\+ \+ *Parts of the flower in threes or fours.*

12. GAURA. Herbs with alternate sessile leaves, and small or smallish flowers in racemes or spikes. Calyx with slender tube much prolonged beyond the 4-celled ovary. Petals 4 (rarely 3), on claws, mostly turned toward the upper side of the flower. Stamens 8 (or 6), these and the long style turned down; a little scale-like appendage before the base of each filament. Fruit small, 4-angled or ribbed, 1–4-seeded, dry and nut-like.
13. TRAPA. Aquatic herbs with leaves of two forms; those submerged opposite and pinnatisect, the floating ones clustered, rhomboid and dentate. Petals and stamens 4. Ovary 2-celled, becoming a large, top-shaped, very hard, nut-like fruit with 2 or 4 horns.

1. EPILÒBIUM, WILLOW-HERB. (Three Greek words meaning *violet on a pod.*) Flowers summer. The pods opening give to the winds great numbers of the downy-tufted seeds. 2

* *Flowers large and showy, in a long spike or raceme, the widely spreading petals on short claws, the stamens and long style bent downwards, and the stigma of 4 long lobes; tower leaves alternate.*

E. angustifòlium, Linn. GREAT W. or FIREWEED. One of the plants that spring up abundantly, everywhere northward, where forests have been newly cleared and the ground burned over; tall (4°–7° high) and simple-stemmed, smooth, with lanceolate leaves, and a long succession of pink-purple flowers.

* * *Flowers small (save in the first) in corymbs or panicles terminating the branches, with petals, stamens, and style erect, and all the lower leaves opposite; stem 1°–2° high.*

+ *Stigma 4-parted; flowers showy.*

E. hirsùtum, Linn. Nat. from Eu. in E. States, and sometimes cult.; a stout branching plant 3°–5° high, densely soft-hairy; leaves mostly opposite and lance-oblong, finely serrate; flowers bright purple, about 1′ across, in a loose, leafy, terminal raceme.

+ + *Stigma clavate; flowers small and mostly rather inconspicuous.*

++ *Leaves more or less revolute, small and narrow, entire or very nearly so. All in bogs N.*

E. palústre, Linn. Slender and low (6′–12′ high), often simple, finely pubescent, the stem more or less angled or marked with hairy lines; leaves erect or ascending, equaling the nodes, sessile, linear or elliptic-oblong and obtuse; capsules either pubescent or nearly glabrous, mostly shorter than the slender peduncles.

E. lineàre, Muhl. Taller and more branched, minutely hoary-pubescent, the stem terete and with only a trace of hairy lines, or none; leaves linear-lanceolate, tapering to a short but distinct petiole, somewhat acute; capsule hoary, the pedicels as long as the leaves.

E. stríctum, Muhl. Densely pubescent, with soft and spreading, somewhat glandular whitish hairs, 1°–3° high; leaves broader, obtuse and veiny, very short-petioled or sessile.

++ ++ *Leaves not revolute, rather broad and thin, prominently toothed. All in wet places N.*

E. coloràtum, Muhl. More or less hoary and glandular-pubescent, 1°–3° high, with angled stems; leaves lanceolate, sharply denticulate and acute, narrowed into a conspicuous petiole; flowers pale and more or less nodding, with pedicels shorter than the leaves; seeds not prolonged at top. Common.

E. adenocaùlon, Haussk. More glandular, with blunter and less toothed leaves which are abruptly contracted into very short petioles; flowers erect, and seeds slightly prolonged at the top.

E. glandulòsum, Lam. Nearly simple, and the pubescence above not glandular; leaves ovate-lanceolate, usually rounded into a sessile base, more or less glandular-toothed.

2. ZAUSCHNÈRIA. (Named for *H. Zauschner*, a Bohemian botanist.) 2

Z. Califórnica, Presl. Cult. for ornament, from Cal., flowering through late summer and autumn; 1°–2° high; the oval or lanceolate leaves and

the pods with downy-tufted seeds resembling those of Epilobium, but the handsome scarlet flowers more like those of a Fuchsia; these are single and sessile in the axils of the upper and alternate leaves, or at length somewhat racemed, about 2′ long.

3. JUSSIÆA. (Named for *Bernard de Jussieu.*) Leaves entire. Flowers yellow and axillary, all summer. 2ℓ

J. decúrrens, DC. Wet grounds, Va. to Ill. and S. Erect stems and slender branches margined or winged in lines proceeding from the bases of the lanceolate leaves, smooth throughout; flowers sessile or short-stalked, with 4 lobes of calyx nearly as long as the petals, and oblong-club-shaped 4-angled pod.

J. rèpens, Linn. Smooth, with creeping or floating and rooting stems, oblong leaves tapering into a slender petiole; long-peduncled flowers 1′ or more across, with 5 calyx lobes, the cylindrical or club-shaped pods tapering at the base. In water from S. Ill. S.

Var. **grandiflòra,** Michl. Marshes S.; has hairy stems erect from a creeping base; lanceolate acute leaves; flowers 2′ in diameter, the 5 calyx lobes only half as long as the petals, and pods cylindrical and stalked.

4. LUDWÍGIA, FALSE LOOSESTRIFE. (Named for *C. G. Ludwig,* an early German botanist.) Small marsh herbs, with entire leaves; flowers seldom handsome, in summer and autumn. 2ℓ

§ 1. *Leaves alternate, mostly sessile.*

* *Flowers peduncled in the upper axils, with yellow petals (about ½′ long), equaling the leaf-like ovate or lance-ovate calyx lobes; stamens and styles slender; pod cubical, strongly 4-angled, opening by a hole at the top; stems 2°–3° long.*

L. alternifòlia, Linn. SEEDBOX. Common E., the only one found far N.; smoothish, branching, with lanceolate leaves tapering to both ends; petals scarcely longer than calyx, and angles of pod wing-margined.

L. virgàta, Michx. Downy, with mostly simple stems; blunt, oblong leaves or the upper linear and smaller; and petals twice the length of the reflexed calyx. Pine barrens S.

L. hirtélla, Raf. Hairy, with simple stems; oblong or lanceolate, short and blunt leaves; and petals twice as long as the barely spreading calyx lobes. Pine barrens from N. J. S.

* * *Flowers sessile in the upper axils, small, and with pale yellow petals about the length of the persistent calyx lobes; stamens and style short; leaves on flowering stems narrow and linear.*

L. lineàris, Walt. Smooth, loosely branched, 1°–3° high, with acute leaves on the flowering stems, but obovate ones on creeping runners; pods oblong-club-shaped or top-shaped, and much longer than the triangular-ovate calyx lobes. Swamps from N. J. S.

* * * *Flowers sessile, often clustered, and with no petals, or rarely mere rudiments; leaves mostly lanceolate, some species with obovate or spatulate leaves on creeping runners; flowering stems mostly 2°–3° long; smooth or smoothish throughout.*

L. cylíndrica, Ell. Much branched, with long, lanceolate, and acute leaves tapering into a petiole; small axillary flowers, and cylindrical pods much longer than the small calyx lobes. Ill. and N. Car. S. and W.

L. polycárpa, Short & Peter. Smooth leaves, narrowly lanceolate and acute at both ends, with conspicuous slender bractlets at the base of the 4-sided rather top-shaped pod, which is longer than the calyx lobes. Mass. W.

L. capitàta, Michx. Slender, simple stems, angled towards the top; long lanceolate leaves; flowers mostly crowded in an oblong or roundish terminal head, and obtusely 4-angled pod longer than the calyx lobes. N. Car. S.

L. alàta, Ell. With simple or sparingly branched stems strongly angled above; few flowers in the axils of the upper wedge-lanceolate leaves, and an inversely pyramidal pod as long as the white calyx lobes, with concave sides and winged angles. N. Car. S.

§ 2. *Leaves opposite, obovate or spatulate, long-petioled, with small and nearly sessile flowers in their axils; stems creeping or floating.*

L. palústris, Ell. Common in ditches and shallow water; smooth, with no petals, or small and reddish ones when the plant grows out of water, and oblong, obscurely 4-sided pods longer than the very short calyx lobes.

L. nàtans, Ell. Larger than the foregoing, and with yellow petals as long as the calyx lobes; the pods tapering to the base. N. Car. S.

§ 3. *Leaves opposite, nearly sessile, with a long-peduncled flower in the axil of some of the upper ones; stems creeping in the mud.*

L. arcuàta, Walt. From coast of Va. S.; a small and smooth, delicate plant, with oblanceolate leaves shorter than the peduncle; yellow petals. longer than the slender calyx lobes, and club-shaped somewhat curved pod.

5. CLÁRKIA. (Named for *Captain Clark*, the explorer.) Herbs of Ore. and Cal., with alternate, mostly entire leaves, and showy flowers in the upper axils, or the upper running into a loose raceme; cult. for ornament; flowers summer. ①

C. pulchélla, Pursh. About 1° high, with narrow, lance-linear leaves, deeply 3-lobed petals (purple, with rose-colored and white varieties), bearing a pair of minute teeth low down on the slender claw, the lobes of the stigma broad and petal-like. There is a partly double-flowered variety.

C. élegans, Dougl. Fully 2° high, commonly flowered in the conservatory, with long branches; lance-ovate or oblong leaves, the lower petioled, lilac-purple entire petals broader than long, and much shorter than their naked claw, smaller lobes to the stigma, and a hairy ovary and pod.

6. EUCHARÍDIUM. (Name from the Greek, means *charming*.) ①

E. concínnum, Fisch & Mey. Of Cal., cult. for ornament; a low and branching plant, like a Clarkia in general appearance, except in the long tube to the calyx, and with ovate-oblong entire leaves on slender petioles, and middle-sized rose-purple or white flowers, in summer.

7. ŒNOTHÈRA, EVENING PRIMROSE. (Greek, application obscure.) Very many species, all originally American, and most of them from the U. S., especially from S. W. and W. The following are the principal common ones, both wild and cult. for ornament; flowers summer. (Pollen grains loosely connected by cobwebby threads, strongly 3-lobed. See Lessons, p. 103, Fig. 316.)

* Yellow-flowered Evening Primroses, *properly so-called, the flowers opening (usually suddenly) in evening twilight, and fading away when bright sunshine returns; odorous; the yellow petals commonly obcordate.*

+– *Stems elongated and leafy; pod cylindrical or spindle-shaped, sessile.* ① ②

Œ. biénnis, Linn. Common E. Wild in open grounds, and the large-flowered forms cult. for ornament; erect, 2°–5° high, hairy or smoothish, with lance-oblong leaves, entire or obscurely toothed; flowers at length forming a terminal leafy-bracted spike, and petals obcordate; calyx tips appressed or contiguous. Runs into several varieties, of which the largest and finest now cultivated belong to

Var. **grandiflòra**, Lindl. From S. W., which is tall and stout, with corolla 3′–4′ in diameter; the sudden opening at dusk is very striking.

Œ. Oakesiàna, Robbins. In New Eng., has a more slender habit, not hairy, the fine pubescence mostly appressed; calyx tips not prominently contiguous.

Œ. rhombipétala, Nutt. Wild on our western limits; more slender, hoary, 1°–3° high, the rather small flowers with rhombic ovate and acute petals.

Œ. Drummóndii, Hook. Cult. from Tex.; has its stems spreading on the ground, and large flowers, like those of the first, in the upper axils; the lance-ovate leaves, etc., soft-downy.

Œ. sinuàta, Linn. Wild from N. J. S. and W., in sandy ground; low and spreading, hairy, with lance-oblong, sinuate or pinnatifid leaves; small flowers in their axils; pale-yellow petals turning rose-color in fading, and slender pods.

+– +– *Stems short and prostrate or scarcely any; pod short, 4-winged.* ② ♃

Œ. tríloba, Nutt. Leaves pinnatifid and cut, like those of Dandelion, smooth, all in a tuft at the surface of the ground, on the short crown, which in autumn is crowded with the almost woody, pyramidal-ovate, narrowly 4-winged sessile pods, forming a mass 3′–5′ in diameter; flowers rather small, the slender tube of the calyx 4′–5′ long, its lobes about as long as the obscurely 3-lobed or notched pale-yellow petals, which turn purplish in fading. Ky. W. and S.

Œ. Missouriénsis, Sims. Cult. from Mo. and Tex.; finely hoary or nearly smooth, with many short prostrate stems, 2′–12′ long, from a thick woody root; crowded, lanceolate, entire or denticulate leaves, very large and showy flowers in their axils, opening before sunset; the tube of the calyx somewhat enlarging upwards, 3′–7′ long; the bright yellow corolla 4′–6′ across; pod with 4 very broad wings.

Var. **latifòlia**, Gray (or Œ. macrocárpa), is a form with larger and greener leaves.

* * White and Red-flowered Primroses, *usually turning rose-colored in fading, some of them opening in the daytime; petals broadly obovate or obcordate; flower buds commonly nodding.*

Œ. acaùlis, Cav. (or Œ. taraxicifòlia). From Chile; rather hairy, at first stemless, at length forming prostrate stems, with pinnatifid or pinnate leaves, after the manner of Dandelion (as one name denotes), and very large flowers in the axils, tube of calyx 3′–4′ long, corolla 3′–5′ across, and a woody, obovate and sharply 4-angled sessile pod. ②

Œ. speciòsa, Nutt. Of Mo. and Tex.; not hardy in cult. N.; pubescent, with erect and branching stems 6′–20′ high; lance-oblong, cut-toothed leaves, the lower mostly pinnatifid; flowers somewhat racemed at the summit, and opening in the daytime; calyx tube rather club shaped and not much longer than the ovary; corolla 3′–4′ across; pod club-shaped. ♃

Œ. albicàulis, Nutt. With erect and white, often shreddy stems, which are glabrous or nearly so, linear or oblong-lanceolate, entire or repand-denticulate, or even sinuate-pinnatifid leaves, linear and sessile, curved or twisted pods; grows from W. Minn. to N. Mex., and is cult. ♃

Œ.ròsea, Ait. MEXICAN PRIMROSE. Minutely downy, with slender spreading stems 6′–24′ high, ovate or lance-oblong leaves, the lower sometimes rather pinnatifid, and red-purple diurnal flowers, 1′ across in leafy racemes; pods club-shaped. Mex. ① ②

* * * YELLOW-FLOWERED, DIURNAL PRIMROSES, *sometimes called* SUNDROPS, *the blossoms opening in bright sunshine; petals mostly obcordate; stems leafy; leaves obscurely toothed or entire. Wild species of the country, all but the last occasionally cultivated.* ② ♃

\+ *Pod short-oblong or obovate, broadly* 4*-wing-angled.*

Œ. glaùca, Michx. Wild from Va. and Ky., near and in the mountains S.; 1°–2° high, smooth, pale and glaucous, leafy to the top; leaves ovate or lance-ovate; corolla 2′ or more in diameter.

\+ \+ *Pod club-shaped, somewhat* 4*-wing-angled above, with* 4 *intervening ribs.*

Œ. fruticòsa, Linn. Wild in open places; not shrubby, as the name would imply; hairy or nearly smooth, with oblong or lanceolate leaves, somewhat corymbed flowers 1½′–2′ in diameter, and short-stalked or nearly sessile, more or less pubescent pods.

Var. **lineàris,** Wats. Wild from Conn. S., near the coast; linear or lance-linear leaves, and pods tapering into a slender stalk. A spreading form is cultivated.

Œ. pùmĭla, Linn. In fields, etc.; nearly smooth, 5′–12′ high, with mostly simple, erect or ascending stem; oblanceolate entire leaves, and scattered flowers, the corolla less than 1′ across, and smooth pods short-stalked or sessile.

8. GODÈTIA. (Named for *Charles Godet,* botanist and entomologist at Neufchatel.) Western American annuals, in gardens. The species are often referred to Œnothera.

* *Capsule ovate or oblong; the seeds in* 2 *rows.*

G. purpùrea, Wats. Very leafy to the top, rather stout, 10′–20′ high, at length with many short branches; leaves pale, lance-oblong, entire, and sessile; corolla 1′–1½′ across, purple, with a dark eye; short and broad lobes of stigma dark-colored; pods short and thick, rather conical, hairy.

G. grandiflòra, Lindl. (or G. WHITNEYI). Stout and nearly simple, with lanceolate leaves acute at both ends and borne on a short petiole, entire or obscurely denticulate; flowers 2′ or more across, light-purple, and usually with a purple spot in the center of each petal; stigma lobes linear; capsule puberulent.

* * *Capsule linear; the seeds in a single row.*

G. amœna, Lilja. (G. LINDLEYI and G. RUBICUNDA). Rather slender, 1°–2° high; leaves linear or lanceolate, entire or very nearly so, with short petioles; petals white or rose-colored, ¾′–1¼′ long, sometimes hairy; stigma lobes linear.

9. LOPÈZIA. (Named for *T. Lopez,* an early Spanish naturalist.) ①

L. racemòsa, Cav. Cult. sparingly, from Mexico; a slender, branching, nearly smooth plant, with alternate, ovate or lance-oblong leaves on

slender petioles, the branches terminated with loose racemes of small rose-pink or sometimes white flowers (only ¼′ in diameter), on slender pedicels from the axil of leafy bracts, produced all summer, followed by very small round pods.

10. FÙCHSIA. (Named for *L. Fuchs*, an early German botanist.) Well-known, ornamental, tender, shrubby plants, or even trees, chiefly natives of the Andes from Mexico to Fuegia, mostly smooth, with opposite or ternately whorled leaves. The best known species are the following: —

* *Erect-flowered species.*

+ *Flowers solitary; plant diœcious.*

F. procúmbens, R. Cunn., from N. Zealand, is a trailing species with small ovate leaves which are very light colored beneath, and small, apetalous, axillary flowers, with an orange calyx tube, and spreading or at length reflexed, dark-purple, obtuse lobes.

+ + *Flowers in a naked and compound terminal panicle-like cluster, perfect.*

F. arboréscens, Sims. TREE F., from Mexico; a stout shrub, with oblong or lance-oblong entire leaves, acute at both ends and usually whorled; flowers light rose-color, ½′ long, with narrow, oblong, widely spreading calyx lobes, and spreading petals rather longer than the tube, about as long as the stamens and style.

* * *Drooping-flowered species.*

+ *Short-flowered Fuchsias or Ladies' Eardrops, with the lobes of the normally red calyx longer than the tube and than the petals; the latter normally violet or blue, obovate and retuse, convolute around the base of the projecting filaments and still longer style; flowers hanging on long peduncles from the axils of the leaves. Common conservatory and house plants.*

F. macrostémma, Ruiz & Pav. The common species, in many forms; has dentate leaves on slender petioles; calyx tube oblong or short-cylindrical, more or less shorter than the spreading lobes. The species now greatly varied in color; some varieties with calyx white or light and the petals deeply colored, some with the reverse; also double-flowered, the petals being multiplied. Chile. F. COCCÍNEA, F. MAGELLÁNICA, F. CÓNICA, F. GRÁCILIS, and F. GLOBÒSA are now commonly referred to this species, although the last, with globular or ovoid calyx tube and nearly globular small flowers, is perhaps specifically distinct.

+ + *Long-flowered Fuchsias, with trumpet-shaped or slightly funnel-shaped tube of the calyx 2′–3′ long, very much longer than the spreading lobes, which little exceed the acute or pointed, somewhat spreading petals; stamens and style little projecting; flowers crowded into a rather close, drooping raceme or corymb at the end of the branches; leaves large, 5′–7′ long. The following species are seen only in choice collections.*

F. fúlgens, Moç. & Sesse, from Mexico; smooth, with ovate, somewhat heart-shaped leaves, and scarlet flowers, the lance-ovate calyx lobes often tinged with green.

F. corymbiflòra, Ruiz & Pav., from Peru; mostly pubescent, with lance-oblong and taper-pointed, almost entire leaves, and red flowers, the lanceolate calyx lobes and the lance-oblong petals taper-pointed, at length widely spreading.

11. CIRCÆA, ENCHANTER'S NIGHTSHADE. (Named from *Circe*, the enchantress, it is not obvious why; the plants are insignificant and inert, natives of damp woods, flowering in summer.) 2

C. Lutetiàna, Linn. The common species, is 1°–2° high, branching, with ovate and slightly toothed leaves; no bracts under the pedicels; the rounded little fruit 2-celled and beset with bristly hairs.

C. alpìna, Linn. Common only N. or in mountainous regions; smooth and delicate, 3′–6′ high, with thin and heart-shaped, coarsely toothed leaves, minute bracts, and obovate or club-shaped fruit, 1-celled and soft-hairy.

12. GAÙRA. (Name in Greek means *superb*, which these plants are not.) Flowers all summer.

G. Lindheimèri, Engelm. & Gray, of Texas; cult. for ornament, nearly hardy N.; about 3° high, hairy, with lanceolate, sparingly toothed leaves; long, weak branches producing a continued succession of handsome, white flowers; the calyx hairy outside; petals nearly 1′ long. 2

G. biénnis, Linn. The common wild species; 3°–8° high, soft-hairy or downy, with oblong-lanceolate obscurely toothed leaves, small, white, or flesh-colored flowers, and downy fruit. ②

13. TRÀPA, WATER CALTROPS or WATER CHESTNUT. (From Latin for the Caltrops, a 4-spined instrument for impeding navigation in times of war.)

T. nàtans, Linn. A curious water plant, occasionally cult., with small, axillary, white flowers, and large nut-like fruits with 2 large and 2 smaller horns. The seeds are eaten in parts of S. Eu., where the species is native. ①

XLVIII. LOASACEÆ, LOASA FAMILY.

Herbs with rough pubescence, and some with stinging bristles, no stipules; a 1-celled ovary coherent with the tube of the calyx (which is little if at all extended beyond it), and mostly with 3–5 parietal placentæ, in fruit a pod, few–many-seeded; persistent calyx lobes and true petals mostly 5, and often an additional inner set of petals; stamens commonly numerous, often in 5 clusters; style single.

* *Erect or spreading, not twining; leaves alternate; petals flat.*

1. MENTZELIA. Petals lanceolate, spatulate, or obovate, deciduous. Filaments long and slender, or some of the outermost broadened or petal-like, all inserted below the petals. Anthers short and small. Style 3-cleft. Pod top-shaped, club-shaped, or cylindrical, straight. Seeds few, rarely many, on 3 parietal placentæ. Herbage rough with short stiff pubescence, or bristly, but not stinging.
2. EUCNIDE. Differs in having the stamens united to the conjoined bases of the petals, and with them falling off in a ring. Style 5-cleft. Seeds many and minute, on 5 broad placentæ. Pod short. Flowers showy, yellow, opening in bright sunshine.

* * *Twining herbs; leaves opposite, petioled; petals hood-shaped or slipper-shaped.*

3. BLUMENBACHIA. Petals 5, spreading, and as many scale-like small ones or appendages alternate with them. Stamens in 5 sets, one before each petal, with very slender filaments; also 10 sterile filaments, a pair before each appendage. Ovary and many-seeded pod, 10-ribbed, when old, spirally twisted and splitting lengthwise. Peduncles axillary, mostly 1-flowered. Herbage beset with sharp bristles, commonly stinging like nettles. Flowers on long axillary peduncles.

1. **MENTZÈLIA.** (Named for *C. Mentzel*, an early German botanist.) Flowers summer or autumn. ① ② Includes the BARTÒNIA of Nuttall.

§ 1. *Pod 3–9-seeded; flowers small, yellow, opening in sunshine.* ① ②

M. oligospérma, Nutt. Open dry ground from Ill., S. W.; a rough and adhesive homely plant, with spreading brittle branches, ovate and oblong angled or cut-toothed leaves, and yellow flowers less than 1′ broad, with 5 wedge-oblong pointed petals, and about 20 (or sometimes more) slender filaments.

§ 2. BARTÒNIA of authors, not of Muhlenberg. *Pod mostly long, containing many or at least 20 cubical or flat seeds; flowers large and showy; petals 1′–2′ long; herbage rough.*

M. Lindleyi, Torr. & Gray. Cult. from Cal., usually under the name of BARTÒNIA AÙREA. Plant 1°–2° high, with leaves lance-ovate in outline and deeply pinnatifid, their lobes linear; flowers with 5 obovate and pointed, bright yellow petals, opening in sunshine, and the very numerous filaments all slender. ①

M. ornàta, Torr. & Gray. The BARTÒNIA ORNÀTA of Nuttall, a very large-flowered species of the plains of Nebraska and S.; 2°–4° high, with oblong-lanceolate sinuate-pinnatifid leaves, and yellowish-white, fragrant flowers opening at sunset or on a cloudy afternoon, leafy-bracted under the ovary, and with 10 lance-ovate or spatulate, acute petals, about 2′ long, the 5 inner narrower, and the 200–300 filaments all slender; seeds very many and flat. Sometimes cult. ②

M. nùda, Torr. & Gray. The BARTÒNIA NÙDA of Nuttall, of the same district, and also in cultivation; resembles the last, but has flowers of half the size and without leafy bracts under the ovary; outer filaments mostly broadened; seeds wing-margined. ②

2. **EUCNÌDE.** (Greek: *well, nettle;* probably in reference to the sharp hairs.) The genus is often referred to Mentzelia. Known in gardens by one species.

E. bartonioìdes, Zucc. (or MENTZELIA BARTONIOÌDES or M. LÓNGIPES). Cult. from Mex. and Tex.; a tender succulent plant, branching and usually spreading on the ground, bristly, with ovate cut-toothed or slightly lobed leaves on slender petioles, and flowers mostly on still longer simple peduncles (3′–6′ long), the 5 ovate petals and very many slender filaments fully 1′ long. ①

3. **BLUMENBÁCHIA.** (Named for the distinguished German physiologist, *Blumenbach.*) Includes CAIÓPHORA, and species often referred to LOÀSA. Flowers all summer.

B. insignis, Schrad. Cult. from Chile; rather curious than ornamental, with palmately about 5-parted leaves; small flowers with white petals and yellow, red-tipped, inner appendages; the pod obovate, slightly twisted, with 5 strongly projecting placentæ. ①

B. laterítia, Gray. From South America, under the name of LOÀSA or CAIÓPHORA LATERÍTIA; climbing freely; with pinnatifid or pinnate leaves of 5 or more lance-ovate divisions or leaflets, which are cut-toothed or some of them again pinnatifid; flowers almost 2′ across, with brick-red petals; the long pod at length much twisted. ①

B. grandiflòra, G. Don (or B. CONTÓRTA). Is a greenhouse climber with orange-red flowers, bearing cup-like scales within, and oblong or ovate pinnatifid leaves, the lobes incised. Peru.

XLIX. PASSIFLORACEÆ, PASSION FLOWER FAMILY.

Represented mainly by the Passion flowers described below. In conservatories may be found one or two species of TACSÒNIA, differing from true Passion flowers in having a long tube to the flowers; also the true Papaw, CARÌCA PAPÀYA.

1. **PASSIFLÒRA**, PASSION FLOWER. (Flower of the Passion; the early Roman Catholic missionaries in South America finding in them symbols of the crucifixion, the crown of thorns in the fringes of the flower, nails in the styles with their capitate stigmas, hammers to drive them in the stamens, cords in the tendrils.) Herbs or woody plants with alternate leaves and conspicuous stipules, climbing by simple axillary tendrils; the flowers also axillary, usually with 3 bracts underneath, and a joint in the peduncle; calyx with a very short tube or cup, and 5 divisions which are colored inside like the petals, and often with a claw-like tip; petals 5 on the throat of the calyx, or sometimes none; within them the conspicuous crown of numerous filaments or rays, forming a double or more compound fringe; stamens 5, with narrow-oblong versatile anthers, their filaments united in a tube below, sheathing and adhering more or less to the long stalk which supports the 1-celled ovary; styles 3; stigmas capitate; fruit berry-like, edible in several species.

* *Herbaceous.*

+ *Petals present.* 2|

P. lùtea, Linn. Low grounds from S. Penn. to Ill. and S.; slender, low-climbing, with the 3 short and blunt lobes of the leaves entire, and a greenish-yellow flower of no beauty, barely 1′ wide.

P. incarnàta, Linn. The fruit, called MAYPOP in S. States, edible, as large as a hen's egg; trailing or low-climbing, with deeply 3-cleft serrate leaves, a pair of glands on the petiole, and one or more on the small bracts, the purple crown of the handsome flower (2′–3′ across) rather longer than the pale petals. Dry ground from Va. and Ky. S.

+ + *Petals absent.* ①

P. grácilis, Link. Slender herb, with roundish and slightly 3-lobed, otherwise entire leaves, and whitish merely 5-cleft flower only 1′ in diameter, destitute of true petals. Remarkable for the quick movement of its tendrils. S. America.

* * *Woody. South American.*

+ *Leaves palmately lobed; flower widely spreading.*

P. cærùlea, Linn. The COMMON or BLUE PASSION FLOWER. With leaves very deeply cleft or parted into 5 or 7 lance-oblong, entire divisions, pale; and flower almost white, except the purple center and blue crown banded with whitish in the middle.

P. édulis, Sims. GRANADILLA. The purplish edible fruit as large as a goose egg; leaves dark green and glossy, deeply cleft into 3 ovate, pointed lobes beset with callous teeth; bracts under the flower also toothed; the crown crisped, 2′ across, whitish with a blue or violet base, as long as the white petals.

+ + Leaves entire, feather-veined; flower bell-shaped.

P. quadrangulàris, Linn. Large Granadilla. Very large, with the branches 4-sided and the angles wing-margined; leaves 4′–8′ long, ovate or oval, or slightly heart-shaped, bright green, with 2–4 pairs of glands on the petiole; flower about 3′ long, fragrant, crimson-purple and the violet or blue crown variegated with white. Fruit rarely formed here, edible, 6′ long.

L. CUCURBITACEÆ, GOURD FAMILY.

Mostly tendril-bearing herbs, with succulent but not fleshy herbage, watery juice, alternate palmately ribbed and mostly lobed or angled leaves, monœcious or sometimes diœcious flowers; the calyx coherent with the ovary, corolla more commonly monopetalous, and stamens usually 3, of which one has a 1-celled, the others 2-celled anthers; but the anthers are commonly tortuous and often all combined in a head, and the filaments sometimes all united in a tube or column. Fruit usually fleshy. Embryo large, filling the seed, straight, mostly with flat or leaf-like cotyledons.

§ 1. *Flowers large or middle-sized, on separate simple peduncles in the axils; anthers with long and narrow cells, bent up and down or contorted; ovules and seeds many, horizontal, on mostly 3 simple or double placentæ; fruit (of the sort called a pepo) large, fleshy or pulpy with a harder rind.*

** Both kinds of flowers solitary in the axils.*

1. LAGENARIA. Tendrils 2-forked. Flowers musk-scented, with a funnel-form or bell-shaped calyx tube, and 5 obcordate or obovate and mucronate white petals; the sterile on a long, the fertile on a shorter, peduncle. Anthers lightly cohering with each other. Stigmas 3, each 2-lobed. Fruit with a hard or woody rind and soft flesh. Seeds margined. Petiole bearing a pair of glands at the apex.
2. CUCURBITA. Tendrils 2–5-forked. Flowers large, with a bell-shaped or short funnel-form 5-cleft yellow corolla, its base adherent to the bell-shaped tube of the calyx. Stamens from the bottom of the flower; anthers long-linear, much curved, all three united into a small head. Stigmas 3, each 2-lobed. Fruit fleshy with a firmer rind. Seeds mostly margined.
3. CITRULLUS. Tendrils 2–3-forked. Flowers with a short bell-shaped calyx tube, and a deeply 5-cleft, widely open, pale yellow corolla. Stamens with very short filaments; anthers lightly cohering. Stigmas 3, kidney-shaped. Seeds marginless, imbedded in the enlarged pulpy placentæ.

** * Sterile flowers clustered, fertile ones solitary in the axils.*

4. CUCUMIS. Tendrils simple. Corolla of 5 almost separate, acute petals. Stamens separate; anthers with only one bend. Stigmas 3, blunt. Fruit with a fleshy rind. Seeds not margined.

§ 2. *Flowers of one or both sorts in racemes, panicles, corymbs, or long-stalked clusters.*

** Fruit large and gourd-like; flowers large.*

5. LUFFA. Flowers cream-colored or orange, with obcordate or obovate petals; the staminate ones in a raceme on a long stalk; the pistillate, solitary and peduncled. Tendrils variously branched. Fruit long-cylindrical, dry when ripe, green, the interior fibrous and sponge-like.

* * *Fruit small and berry-like; flowers very small for this Family.*

\+ *Fruit smooth; ovules and seeds many, horizontal, on 3 placentæ; filaments separate; anthers straightish; tendrils simple.*

6. MELOTHRIA. Flowers yellow or greenish, the sterile in small racemes, the fertile solitary on a long and slender peduncle. Corolla open bell-shaped, 5-cleft. Anthers slightly united, soon separate. Fertile flower with calyx tube constricted above the ovary.

\+ \+ *Fruit prickly; ovules and seeds* 1–4, *large and vertical; filaments monadelphous; anthers tortuous; tendrils* 3-*forked.*

7. ECHINOCYSTIS. Flowers white, the sterile in compound racemes or panicles, the fertile solitary or in small clusters from the same axils. Corolla wheel-shaped, of 6 narrow petals united at the base. Anthers more or less united in a mass. Style hardly any; stigma broad. Fruit oval or roundish, beset with weak, simple prickles, bursting irregularly at the top when ripe; the outer part fleshy under the thin, green rind, becoming dry; the inner part a fibrous network making 2 oblong cells, each divided at the base into two 1-seeded compartments. Seeds large, blackish, hard-coated, erect from the base of the fruit.

8. SICYOS. Flowers greenish-white, the sterile in corymbs or panicles, the fertile (very small) in a little head on a long peduncle, mostly from the same axils. Corolla nearly wheel-shaped, 5-cleft. Anthers short, united in a little head. Style slender; stigmas 3. Ovary tapering into a narrow neck below the rest of the flower, 1-celled, becoming a dry and indehiscent, ovate or flattish-spindle-shaped, bur-like fruit, beset with stiff and barbed bristles, filled by the single hanging seed.

1. LAGENÀRIA, BOTTLE GOURD. (Latin *lagena*, a bottle.) ①

L. vulgàris, Ser. BOTTLE, SNAKE, and SUGAR-TROUGH GOURD, CALABASH. Cult. from Africa and Asia; climbing freely, rather clammy-pubescent and musky-scented, with rounded leaves, long-stalked flowers, white petals greenish-veiny, and fruit of very various shape, usually club-shaped, or long and much enlarged at the apex and slightly at base, the hard rind used for vessels, dippers, etc.

2. CUCÚRBITA, PUMPKIN, SQUASH, GOURD. (Latin name.) ①

The very numerous cultivated forms, strikingly different in their fruit, belong to three botanical species. Probably native to America.

* *Stalks and somewhat lobed leaves rough-bristly almost prickly; flower-stalks obtusely angled, that of the fruit strongly* 5–8-*ridged and with intervening deep grooves, usually enlarging next the fruit; hollow interior of the fruit traversed by coarse and separate, soft or pulpy threads; flower tube flaring, the lobes pointed and erect.*

C. Pèpo, Linn. PUMPKIN. Cult., as now, along with Indian Corn, by the North American Indians before the coming of the whites. The chief types are: the common FIELD PUMPKIN used for pies and fed to stock; the BUSH SCALLOP SQUASHES with white or yellow fruit flattened endwise and the vines scarcely running; the SUMMER CROOK-NECK or WARTY SQUASHES, with white or yellow J-shaped fruits, and vines seldom running; the GOURDS, small, very hard-shelled fruits of many shapes and colors borne on slender running vines.

* * *Stalks and bright green* 5–7-*lobed leaves pubescent with soft hairs; fruit stalk* 5-*ridged, prominently enlarged where it joins the fruit, the central pulp less thready; flower tube much like* *, *the lobes broader: calyx lobes often leafy.*

C. moschàta, Duchesne. CHINA, CUSHAW, CANADA CROOK-NECK, WINTER CROOK-NECK SQUASHES. Cult. for the edible fruit, which is

club-shaped, pear-shaped, or long-cylindrical, often large with a glaucous-whitish surface, often green-striped.

* * * *Stalks and almost kidney-shaped or roundish leaves roughish hairy; flower stalks terete, that of the fruit thick, many-striate but not ridged and grooved; inner pulp copious and not thready; flower tube nearly cylindrical or even gibbous below, the lobes obtuse and drooping.*

C. máxima, Duchesne. WINTER and TURBAN SQUASH. Fruit rounded, or ovate and pointed, often grooved lengthwise, varying from 6′ to 3° in length or breadth, the hard flesh yellow or orange. The crowned or TURBAN SQUASHES have the top of the fruit projecting beyond an encircling line or constriction which marks the margin of the adherent calyx tube. Here belong the best fall and winter squashes, as HUBBARD, BOSTON MARROW, etc.

3. CITRÚLLUS, WATERMELON. (Name made from *Citrus*, Latin for Orange or Citron.) ①

C. vulgàris, Schrad. WATERMELON. Cult. from Asia. Prostrate, with leaves deeply 3–5-lobed, and the divisions again lobed or sinuate-pinnatifid, pale or bluish; the refreshing edible pulp of the fruit, in which the dark seeds are imbedded, consists of the enlarged and juicy placentæ, which are reddish or rarely white. — The so-called CITRON of gardens is a variety with a firm or hard flesh, used for preserving.

4. CÙCUMIS, MELON and CUCUMBER. (The Latin name.) ①

C. Mèlo, Linn. MELON, MUSKMELON, CANTALOUPE. Leaves round-heart-shaped or kidney-shaped, the lobes, if any, and sinuses rounded; fruit with a smooth rind and sweet flesh, the edible part being the inner portion of the pericarp, the thin and watery placentæ being discarded with the seeds. S. Asia. Var. ***flexuòsus***, the SERPENT MELON, sometimes called SNAKE CUCUMBER, is a strange variety with a long and snake-like fruit. Var. ***Dùdaim***, with small curiously mottled fruits grown for their novelty and agreeable odor, is the VEGETABLE POMEGRANATE, QUEEN ANNE'S POCKET MELON, or C. ODORATÍSSIMUS. Var. ***Chìto*** is the VEGETABLE ORANGE or LEMON or APPLE, also called VINE PEACH, distinguished by slender vines and yellow sourish fruits the size of a goose egg.

C. sativus, Linn. CUCUMBER. Leaves more or less lobed, the lobes acute, the middle one more prominent, often pointed; fruit rough or muricate when young, smooth when mature, eaten unripe. S. Asia.

C. Angùria, Linn. WEST INDIAN or BURR GHERKIN. GOOSEBERRY GOURD. Stems slender and hispid; leaves deeply cut into 3–5 narrow segments; flowers small, long-stalked; fruit 1′–2′ long, rough and spiny.

5. LÚFFA, RAG GOURD, DISHCLOTH GOURD. (Arabic name.) ①

L. cylíndrica, Rœm. A cucumber-like vine with grape-like leaves about 5-angled or lobed and irregularly toothed; fruit 10′–20′ long, often curved, cylindrical and smooth, green, pointed at the apex, the interior portion becoming detached when dry and useful as a sponge; whence the names VEGETABLE SPONGE and DISHCLOTH GOURD. Tropics.

6. MELÒTHRIA. (An ancient Greek name for some sort of grape.) 2

M. péndula, Linn. From Va. S., is a delicate low-climber, with roundish or heart-shaped and 5-angled or lobed, roughish leaves, minute flowers, in summer, and oval green berries.

7. ECHINOCÝSTIS, WILD BALSAM APPLE, WILD CUCUMBER. (Name from Greek for *hedgehog* and *bladder.*) ①

E. lobàta, Torr. & Gray. Low grounds, chiefly N. and W., and cult. for arbors; tall-climbing, smoothish, with strongly and sharply 5-lobed leaves; copious and rather pretty white flowers, produced all summer, and oval fruit 2′ long, dry and bladdery after opening; seeds flat.

8. SICYOS, STAR CUCUMBER. (Ancient Greek name of Cucumber.) ①

S. angulàtus, Linn. A weed in damp or shady grounds, commoner S.; climbing high; clammy-hairy, with roundish, heart-shaped and 5-angled or slightly lobed leaves; inconspicuous flowers, and little bur-like fruits beset with deciduous, barbed prickles.

LI. BEGONIACEÆ, BEGONIA FAMILY.

Somewhat succulent, herbaceous or more or less woody-stemmed, mostly perennial house plants, with alternate and unequal-sided leaves, deciduous stipules, and monœcious flowers in cymes or clusters on axillary peduncles, numerous stamens, inferior triangular ovary, becoming a many-seeded pod, — represented in choice cultivation by the genus

1. BEGÒNIA, ELEPHANT'S EAR, BEEFSTEAK GERANIUM. (Named for *M. Begon*, Governor of St. Domingo 200 years ago.) Flowers with the calyx and corolla colored alike, sometimes dull but usually handsome, both kinds commonly in the same cyme, and flat in the bud; the outer pieces answering to sepals, mostly 2, valvate in the bud; the inner, or true petals, 2, or in the fertile flowers usually 3 or 4, or not rarely wanting, in the sterile flowers surrounding a cluster of numerous stamens with short filaments; in the fertile are 3 styles with thick or lobed stigmas. Ovary and pod triangular, often 3-winged. These curious plants are remarkable for the beauty of the leaves of many species, as well as for flowers of many colors and patterns. There are very many species and hybrids. Following are some of the commonest: —

I. TUBEROUS BEGONIAS. *Low or even stemless plants, arising from a bulb-like tuber, and bearing very large* (2′–4′ *across*) *showy flowers, generally in summer and autumn; leaves not showy. A new class of popular flowers, developed chiefly from the following, which are natives of Peru and Bolivia.*

* *Stemless; scapes* 4′–12′ *high.*

B. Davísii, Veitch. Leaves on very short stalks, ovate-cordate, somewhat hairy, glossy green, the under surface, like the scapes and flowers, bright red; flowers 2′ across, on 3–6-flowered scapes, 4′–6′ high, and standing above the leaves; petals 4.

B. roscæflòra, Hook. Leaves orbicular or kidney-shaped, lobed and toothed; flowers 2′ across, rose-red, on hairy, about 3-flowered, stout scapes; petals 5.

* * *Stem evident, but often short; mostly taller.*

B. Vèitchii, Hook. Stem very short; leaves roundish, scallop-lobed, with ciliate margins, and a red spot near the center; scape 12′ high, bearing twin brick-red flowers, 2′ or more across, with 5 rounded, spreading petals. This and the last are types of many garden forms.

B. Pèarcei, Hook. A foot high, with lance-cordate leaves, reddish-tomentose beneath; flowers yellow, several, on rather slender pedicels.

B. Boliviénsis, A. DC. About 2°, branching; leaves nearly lanceolate, very sharply serrate; flowers large (2′ long), bright red, in drooping panicles; the petals lanceolate-acute, not spreading.

II. Non-Tuberous (except B. Evansiana), *comprising a great variety of species, some of them from short subterranean rhizomes and stemless.*

* *Stemless; leaves, or especially the petioles, and the peduncles or scapes, bristly-hairy, these all from a fleshy tuberous or creeping rootstock.*

† *Leaves large, obliquely heart-shaped, toothed or merely wavy-margined, variously silvered or variegated above, reddish or purple beneath; flowers rather large, but not showy; cult. for their foliage, now much crossed and mixed.*

B. Rex, Putz. The most prized and now the commonest species of the group, with the leaf silver-banded or silvery all over the upper face; and smooth, pale, rose-colored flowers. Himalaya.

B. Griffithii, Hook. Like the preceding, but leaves and stalks more downy-hairy, and the almost white flowers hairy outside. Himalaya.

B. xanthìna, Hook. With leaves, etc., much as in the two preceding, but the flowers yellow. Himalaya.

†† *Leaves deeply about 7-cleft; flowers with only the 2 sepals, no petals.*

B. heracleifòlia, Cham. & Schlecht. With rather large and rounded, hardly oblique leaves, smooth above and sometimes variegated, the lobes broad lanceolate and cut-toothed, and small, pale rose or whitish flowers. Mexico.

B. ricinifòlia is a hybrid of the last and B. peponifolia.

* * *Stems elongated, naked, bearing tubers or bulblets in the axils; leaves slightly bristly-hairy above and more so on the sharp teeth.*

B. Evansiàna, Andr. (or B. discolor), an old-fashioned species from China, now rare, almost hardy even N., producing all summer showy, rose-colored flowers in the open ground; the ovate and heart-shaped, pointed leaves not very oblique, red beneath.

* * * *Stems fleshy, erect or ascending; leaves smooth and naked above, bristle-bearing on the toothed or cut margins and long petioles; flowers with the 2 colored sepals, but seldom any petals.*

B. manicàta, Cels. A handsome species of the conservatory, remarkable for the purple, bristle-bearing scales or fringes on the apex or upper part of the petiole, and similar smaller tufts on the ribs of the lower face of the large and broadly ovate-heart-shaped leaves; flowers small, but numerous and elegant, in an open panicle on a very long, naked peduncle, flesh-colored. Mexico.

B. phyllomaniaca, Mart. Stem thickly beset with leaf-like scales or little adventitious leaves, from which the plant may be propagated, both leafstalks and peduncles bristly, the large leaves ovate-heart-shaped and tapering to a narrow point, their margins cut-toothed, and rather large but not showy flowers. Brazil.

* * * * *Leafy-stemmed, rather tall-growing; leaves and whole plant smooth and naked.*

+– *Leaves ovate or oblong, not heart-shaped, very small* (1′ *or less long*).

B. fuchsioìdes, Hook. So-called because the bright scarlet flowers, hanging on a slender drooping stalk, may be likened to those of Fuchsia; the crowded and small green and glossy ovate leaves only a little unequal-sided at base, serrate with bristle-tipped teeth; stem tall and strict. Mexico.

B. foliòsa, HBK. Lower, stem diffuse; leaves oblong and smaller, obtuse at the base, strongly setose-serrate; flowers numerous, white tinged with pink. S. America.

+– +– *Leaves obliquely heart-shaped or half heart-shaped at base.*

++ *Almost entire.*

B. nítida, Dryander. Leaves obliquely heart-shaped and glossy, green both sides, and with large, light rose-colored flowers. Jamaica.

B. sanguínea, Raddi. Leaves large and fleshy, obliquely ovate-heart-shaped, having a narrow revolute margin, pale green above, red beneath, as are the stalks; the flowers white, not showy. Brazil.

B. maculàta, Raddi. Cult. under the name of B. ARGYROSTÍGMA, both names referring to the silvery-white spots scattered over the upper face of the leaves, which are narrower and more oblong than in the preceding, purplish or crimson beneath, the margin cartilaginous but not revolute, the flowers white or flesh-colored. Brazil.

B. coccínea, Ruiz. Flowers scarlet, as the name denotes (but cult. as B. RÚBRA), and oblong half heart-shaped leaves, glossy above, and green both sides or purple at the margin, which is a little wavy-toothed. Flowers long, with red pedicels, wax-like. Tall. Peru.

++ ++ *Prominently serrate or crenate.*

B. incarnàta, Link & Otto (including B. METÁLLICA). From Mexico; is 2° high, with swollen joints, sinuate-serrate green or bronze leaves on short stalks, and large, rose-colored, nodding flowers.

B. sempérflorens, Link & Otto. Stem stout and fleshy; leaves ovate, subcordate and rather acute, crenate-undulate or serrate and ciliate, glossy green; flowers rather large, white or rose-colored, in small axillary clusters near the top of the stem. S. Brazil.

LII. CACTACEÆ, CACTUS FAMILY.

Fleshy plants of peculiar aspect, mostly persistent and destitute of foliage; the leaves supplied by the green rind of the flattened, columnar, globular, or various-shaped stem; the perfect solitary and sessile flower with calyx adherent to the ovary, its lobes or sepals, the petals, and the stamens numerous, usually in several ranks, the latter mostly very numerous; ovary 1-celled with several parietal placentæ; style single, with several stigmas; the fruit a 1-celled and generally many-seeded pulpy berry. (Lessons, Figs. 111, 229.) Numerous species, all but one native to the New World. Many are cultivated, but their study requires special knowledge, and only the leading group-forms are specified here.

§ 1. *Tube formed of the united sepals, more or less extended beyond the ovary; stem either continuous or jointed.*

* *Stems or branches 3-many-angled, or grooved, or terete, and with tubercles or woolly tufts bearing a cluster of spines, prickles, or bristles.*

+ *Stem mostly elongated, rarely globular; flower tube scaly.*

1. CEREUS. Stem regularly ribbed or angled lengthwise, and with the clusters of spines or bristles on the ridges one above the other. Flowers from the side of the stem, commonly with a conspicuous tube, which, with the ovary below, is beset with scale-like sepals and generally with woolly or bristly tufts in their axils. Petals numerous and spreading.

+ + *Stem globular or very short; flower tube not scaly.*

2. ECHINOCACTUS. Stem with many ribs or ridges, bearing clusters of spines one above the other. Flowers naked at the summit of the ridges, and with a short or very short tube; otherwise as in Cereus.

3. MAMILLARIA. Stems mostly tufted, not ribbed, covered with distinct and strongly projecting nipple-shaped tubercles, which are arranged in spiral order and tipped with a cluster of prickles. Flowers from the axils of the tubercles, with a short tube. Ovary and berry not scaly.

* * *Stems and branches of flat and leaf-like joints, with the margins more or less toothed or crenate, and with an evident woody center or midrib, with no prickles and bristles, or only tufts of very short ones in the notches.*

4. EPIPHYLLUM. Joints of the branches short and truncate, very smooth, and flowering from the end. Flowers open in the daytime and for several days, mostly oblique, the tube not much lengthened; the sepals and petals rose-red, rather few, the innermost and larger ones about 8. Stamens not very many. Stigmas erect or conniving.

5. PHYLLOCACTUS. Leaf-like branches or joints long, arising from the side of older ones, which with age form terete stems. Flowers from the marginal notches, slightly if at all irregular. Stigmas slender and spreading.

§ 2. *No tube to the flower above the ovary; stem jointed.*

6. OPUNTIA. Stem branching, formed of successive joints, which are mostly flat, bearing at first some minute awl-shaped bodies answering to leaves, which soon fall off, and tufts of barbed bristles and often prickles also in their axils. Flowers from the edge or side of a joint, opening in sunshine and for more than one day.

1. CÈREUS. (Probably from Latin: *wax taper* or *candle*, from the form of the stem of some species.) The following are the commonest in cultivation, mostly from Mexico and S. America; flowers summer.

§ 1. *Stems and branches long, spreading, creeping or climbing, remotely jointed more or less, only 3–7-angled, very large flowered.*

* *Flower red, open in daytime for several days; stamens much declined.*

C. speciosíssimus, DC. The commonest red-flowered Cactus; with stems 2°–3° high, rarely rooting, 3 or 4 broad and thin wavy-margined angles or wings, and crimson or red flowers of various shades, 4′–5′ in diameter, the tube shorter than the petals.

* * *Flower white as to petals, opening at night, collapsing next morning, fragrant, 6′–9′ in diameter when expanded, the tube 4′–5′ long; stems rooting and so climbing; prickles short and fine.* NIGHT-BLOOMING CEREUS.

C. triangulàris, Mill., has sharply triangular stems, minute prickles, and flower with glabrous tube, olive-green sepals, and yellow stamens.

C. nycticàlus, Link, has 4–6-angled stems with very minute prickles, and flower much like the next, but with brownish sepals.

C. grandiflòrus, Mill. COMMON NIGHT-BLOOMING CEREUS. Stems terete, with 5–7 slight grooves and blunt angles, bearing more conspicuous prickles, long bristles on the flower tube, and dull-yellow sepals.

§ 2. *Stems and branches long, weak, disposed to trail or creep, remotely jointed, cylindrical, with 8–12 ribs or grooves, and rows of approximated short and fine prickle clusters; flowers smaller.*

C. serpentìnus, DC. Stems 1′ or more in diameter, tapering at the apex, about 12-ribbed, disposed to stand when short, not rooting; flower opening for a night, fragrant, with linear petals reddish-purple outside, nearly white inside, 2′ long, rather shorter than the tube.

C. flagelliformis, Mill. Rat-tail Cactus. Stems long and slender, prostrate, or hanging and rooting; flower 2′–3′ long, the narrow sepals and petals not very many, rose-red, open by day.

§ 3. *Stems erect, self-supporting, tall-growing, cylindrical and column-like, with about 8 (6–10) obtuse ribs and grooves; short, mostly dark-colored prickles 9–12 in the cluster, and no long bristles; flower large, white, tube 3′–6′ long.*

C. Peruviànus, Mill. The largest species (except the Giant Cereus of Arizona), becoming even 40° high and thick in proportion, with rather strong compressed ribs and stout prickles; the flower 6′ long, with greenish sepals and white or externally rose-tinged petals proportionally short.

Var. monstruòsus, in old conservatories, has a short stem with 4–8 irregular and wavy, wing-like angles, sometimes broken up into tubercles.

§ 4. *Stem erect and simple, at length cylindrical, with 20–25 narrow ridges, bearing clusters of short prickles and long bristly hairs.*

C. senìlis, Salm-Dyck. (or Pilocèreus senìlis). Old Man Cactus. Cult. for its singular appearance, the long, white, hanging bristles at the top likened to the locks of an aged man; flowers (seldom seen) not large, with a very short tube.

2. ECHINOCÁCTUS. (Name means *Spiny* or *Hedgehog Cactus.*) Many wild species far S. W. Flowers mostly small, opening for 2 or 3 days, closing at night.

E. Texénsis, Hopf., of S. Tex. and Ariz., has stem much broader than high, or globular when young, becoming 1° broad, with 12–27 acute wavy ridges; 6 or 7 very stout and horn-like, reddish, recurved spines, the central one larger and turned down, sometimes 2′ long; flower rose-colored, very woolly, 2′ long.

E. Ottònis, Link & Otto. Pear-shaped, becoming club-shaped, 2′–3′ thick, with 12–14 narrow ridges, clusters of 10–14 short slender prickles, and yellow flowers with red stigmas. Brazil.

3. MAMILLÀRIA. (Name from the nipple-shaped tubercles which cover the stem.) Many wild species far W. and S. W. on the plains.

M. pusílla, DC. Wild in Tex. and S., with clustered ovate or globular stems 1′–2′ long, oblong or ovate tubercles bearing wool in their axils, and tipped with very many capillary crisped bristles and several slender prickles; flowers pink, ½′ long.

M. elongàta, DC. With cylindrical clustered stems, covered with short conical tubercles, which bear 16–30 uniform, radiating, and recurving, slender prickles in a starry tuft, and very rarely a central one; flowers small, creamy-white. Mex.

M. vivípara, Haw. 1′–5′ high, simple, or proliferous in tufts, globular, with the terete tubercles slightly grooved down the upper side, bearing 12–30 rigid, widely radiating, whitish prickles, and 3–12 stouter and darker ones; flower pink-purple, large for the plant, about 2′ in diameter. Dak., Kans., W.

4. EPIPHÝLLUM. (Name from Greek, meaning *upon a leaf*, i.e., the flower from the top of what seems to be a leaf.) Flowers usually in summer.

E. truncàtum, Haw. Cult. from Brazil; low, bright green, with drooping branches; the oblong joints scarcely 2′ long, the upper end with a shallow notch; flower 2′–3′ long, oblique, with petals and short sepals spreading or recurved, the former so arranged that the blossom often appears as if 2-lipped.

5. PHYLLOCÁCTUS. (Greek: *Leaf-Cactus.*) Cult. from S. America and Mexico; flowers summer.

* *Flower with tube shorter than the petals, red, scentless, open through more than one day; petals and stamens many, except in the first species.*

P. bifórmis, Lab. The least showy species; with slender stems, and two sorts of branches, one ovate or oblong, the other lanceolate; the latter producing a slender pink flower, 2′ long, with about 4 slender sepals, as many narrow lanceolate erect petals, with spreading tips, and only 8–16 stamens.

P. phyllantholdes, Link. Has narrow-oblong, sinuate-toothed, leaf-like branches; numerous, rose-colored, oblong and similar sepals and petals, the outermost widely spreading, the innermost erect.

P. Ackermánni, Link. Like the preceding, but much more showy, with bright red and sharp-pointed petals spreading and 2′–3′ long, and the scattered sepals small and bract-like.

* * *Flower sweet-scented, with tube 4′–10′ long, bearing scattered and small scaly sepals or bracts, which are considerably longer than the numerous spreading white or cream-colored petals.*

P. crenàtus, Walpers. Leaf-like branches 1°–2° long, 2′–3′ broad, sinuately notched; flower open in the daytime and for several days, 7′–8′ in diameter, with the stout tube 4′–5′ long, the outer petals or inner sepals brownish.

P. Phyllánthus, Link. Branches nearly as in the preceding; but the flower opening at evening and lasting only till morning, its slender tube many times longer than the small petals.

6. OPÚNTIA, PRICKLY PEAR CACTUS, INDIAN FIG. (An ancient name transferred to these American plants.) Flowers summer. Fruit often edible.

§ 1. *Stamens not longer than the roundish, in ours yellow, widely opening petals.*

* *Low, prostrate, or spreading; native species, also cultivated.*

O. vulgàris, Mill. COMMON PRICKLY PEAR. On rocks and sand, from coast of N. Eng., S., with pale and rounded obovate flat joints, 3′–6′ long, bearing minute appressed leaves, having bristles, but hardly any spines in their axils, and a nearly smooth edible berry.

O. Rafinésquii, Engelm. Common W. and S. W.; deeper green, with joints 4′–8′ long, the little leaves spreading, several small spines and a single stronger one in the clusters, and flower often with a reddish center.

O. Missouriénsis, DC. From Wis. W. on the plains; with obovate joints 2′–4′ long and tubercled, tufts of straw-colored bristles and 5–10 long and slender spines; the berry dry and prickly.

O. Pes-Córvi, LeConte. On the coast S., with small and narrow, almost cylindrical, easily separable joints, their spines in pairs; the berry small and bristly.

* * *Erect, shrubby, or tree-like, cultivated in conservatories from W. Indies and S. America; berry edible.*

O. Ficus-Índica, Haw. Joints obovate, thick and heavy, 1° long, with minute spines or none; berry obovate, bristly.

§ 2. *Stamens longer than the erect crimson petals, shorter than the style.*

O. coccinellífera, Mill. Tree-like, 6°–10° high, with joints of the branches obovate-oblong, 4′–12′ long, spineless or nearly so, when young with single recurved spines, pale; berry red. One of the plants upon which the cochineal insect feeds, whence the name. Sometimes cult. Mex. and W. Indies.

LIII. FICOIDEÆ, FIG MARIGOLD FAMILY.

Mostly fleshy herbs, generally with opposite or whorled leaves and no stipules, very closely allied to the Pink and Purslane Families; differing in apetalous (in ours) flowers, the 2- or more-celled capsule which is 2–several-seeded, the stamens generally numerous (not so in ours), and seeds with a slender curved embryo. A heterogeneous family, represented in gardens by the Ice Plants (of which the common one is Mesembryánthemum crystállinum) and the Fig Marigolds, of the same genus.

1. SESUVIUM. Calyx 5-lobed, petal-like. Stamens 5 (in ours) on the calyx. Styles 3–5. Capsule circumscissile.
2. MOLLUGO. Calyx of 5 separate sepals. Stamens 3–5, hypogynous. Stigmas 3. Capsule 3-valved.
3. TETRAGONIA. Calyx 4-lobed. Stamens (in ours) in clusters. Styles and 1-ovuled cells few. Fruit hard and nut-like, horned, 3–8-seeded.

1. SESÙVIUM, SEA PURSLANE. (Name unexplained.) Prostrate, succulent, seaside herbs.

S. pentándrum, Ell. Leaves oblong- or obovate-spatulate, obtuse; flowers axillary or terminal, sessile, small. Plants procumbent or sometimes partially erect. Seacoast, N. J., S. ①

2. MOLLÙGO, INDIAN CHICKWEED. (Ancient name.) Low, weed-like plants with the habit of Chickweed, and sometimes referred to the Pink Family.

M. verticillàta, Linn. Carpet Weed. Prostrate and forming flat patches on the ground, not succulent; the small, spatulate leaves are clustered or whorled, and the 1-flowered pedicels form an umbel-like cluster; flowers small and whitish. About cult. grounds. Tropics. ①

3. TETRAGÒNIA. (Name Greek for *four-angled*, from shape of the fruit.) Low, spreading herbs, with broad and flat, thickish leaves, and small flowers in their axils.

T. expánsa, Ait. New Zealand Spinach. Occasionally cult. as a Spinach; leaves pale, triangular, or rhombic-ovate, with short margined petioles. ①

LIV. UMBELLIFERÆ, PARSLEY FAMILY.

Herbs, some innocent and many of them aromatic, others acrid-narcotic poisons, with small flowers in umbels, calyx adherent to the 2-celled ovary, which has a single ovule hanging from the summit of each cell, 5 minute calyx teeth or none, 5 petals, 5 stamens, and 2 styles; the dry fruit usually splitting into 2 seed-like portions or akenes; seed with hard albumen and a minute embryo. Eryngium and one or two others have the flowers in heads instead of umbels. Stems usually hollow. Leaves alternate, more commonly compound or decompound. Umbels mostly compound; the circle of bracts often present at the base of the general umbel is called the *involucre;* that at the base of an umbellet, the *involucel.* The flowers are much alike in all, and the characters are taken from the form of the fruit, and much stress is laid upon the receptacles of aromatic oil (*vittæ* or oil tubes) which are found in most species and give characteristic flavor. The family is too difficult for the beginner; so that only the common cultivated species, and the most conspicuous or noteworthy wild ones are given here.

§ 1. *Fruits covered with little scales or tubercles, crowded (as are the flowers) in a head instead of an umbel, and with a pointed scaly bract under each flower.*

1. ERYNGIUM. Flowers blue or white, with evident awl-shaped calyx teeth, and top-shaped fruit without any ribs. Leaves in our species simple and with bristly or prickly teeth.

§ 2. *Fruits covered with bristly prickles, bur-like; umbels compound.*

2. SANICULA. Flowers greenish or yellowish, so short-stalked or nearly sessile that the umbellets appear like little heads, each with some perfect and fertile and some staminate flowers. Fruits ovoid or globular, not readily splitting in two, not ribbed, completely covered with short, hooked prickles. Leaves palmately parted.

3. DAUCUS. Flowers white or cream-color, in a regular compound umbel; the petals unequal, or those of the marginal flowers larger. Prickles in rows on the ribs of the short fruit, which splits in two when ripe. Leaves pinnately compound or decompound.

§ 3. *Fruits naked (not prickly), splitting when ripe and dry into two one-seeded pieces or carpels, each usually with 5 ribs or some of them may be wings. Fruits mostly with oil tubes in the form of lines or stripes, one or more in the intervals between the ribs, and some on the inner face, sometimes also under the ribs.*

* *Fruit wingless.*

\+ *Marginal flowers larger and irregular.*

4. CORIANDRUM. Fruit globular, not readily splitting in two, indistinctly many-ribbed: a pair of large oil tubes on the inner face of each carpel. Flowers white. Leaves pinnately compound. Plant strong-scented.

+ + Flowers all alike, generally white.

++ Seed deeply grooved or hollowed down the inner face.

= Fruit long and slender, club-shaped, or tapering at the base.

5. OSMORRHIZA. Fruit somewhat sweet-aromatic; no obvious oil tubes. Leaves twice or thrice ternate. Root sweet-aromatic.

= = Fruit ovate or orbicular.

6. ERIGENIA. Fruit twin, nearly orbicular, with many oil tubes, 5 very slender ribs, flattened on the sides. Low plant in early spring, with finely cut ternately decompound leaves; flowers in small heads on a 2–3-rayed leafy umbel, and springing from a round, deep tuber.
7. CONIUM. Fruit short, broadly ovate, rather strong-scented, compressed at the sides, each carpel with 5 strong and more or less wavy ribs; oil tubes many and minute. Leaves pinnately decompound.

++ ++ Seed slightly if at all hollowed out on the inner face.

= Leaves once-pinnate.

8. SIUM. Fruit globular or short-oblong and contracted on the sides, each carpel with 5 strong or corky ribs, and commonly 2 or more oil tubes in the narrow intervals. No axis or hardly any left when the carpels separate. Flowers white. Not aromatic.

= = Leaves decompound.

‖ Fruit flattened on the back and front.

9. FŒNICULUM. Fruit oblong; the two carpels with a broad flat face, 5 stout ribs, and a single oil tube in the intervals between the ribs. Flowers yellow. Leaflets slender thread-shaped. Whole plant sweet-aromatic.

‖ ‖ Fruit flattened on the sides.

10. CICUTA. Fruit globular and contracted on the sides, each carpel with 5 broad and thickened blunt ribs, and an oil tube in each interval; the slender axis between the carpels splitting in two. Flowers white. Leaves not aromatic. Fruit aromatic.
11. APIUM. Fruit ovate or broader than long, flattened on the sides, each carpel 5-ribbed and a single oil tube in the intervals; axis left when the carpels separate not splitting in two. Flowers white.
12. CARUM. Fruit ovate or oblong, flattish on the sides; each carpel with 5 narrow ribs, and a single oil tube in the intervals; the axis from which the carpels separate splitting in two. Flowers mostly white. Fruit or foliage aromatic.

** * Fruit winged or wing-margined at the junction of the two carpels, which are flat on the face and flat or flattish and 3-ribbed on the back. Leaves pinnately or ternately compound.*

+ Wing double at the margins of the fruit.

13. LEVISTICUM. Fruit ovate-oblong, with a pair of thickish marginal wings, and single oil tube in each interval. Involucre and involucels conspicuous, the bracts of the latter united by their margins. Flowers white. Plant sweet-aromatic.
14. ANGELICA. Fruit ovate or short-oblong, with thin or thickish marginal wings, and many small oil tubes adherent to the surface of the seed. Involucels of separate mostly small bracts; involucre hardly any. Flowers white or greenish.

+ + Wing surrounding the margin of the fruit, single, splitting in two only when the ripe carpels separate.

15. HERACLEUM. Fruit, including the thin and broad wing, orbicular, very flat, and the three ribs on the back very slender; the single oil tubes in the intervals reaching from the summit only half-way down. Flowers white, the marginal ones larger and irregular. Leaves ternately compound. Plant strong-scented.
16. PASTINACA. Fruit oval, very flat, thin-winged; the single oil tubes running from top to bottom. Flowers yellow, the marginal ones not larger. Leaves pinnately compound.

1. **ERÝNGIUM**, ERYNGO. (Ancient name.) Flowers in summer.

E. yuccæfòlium, Michx. Button Snakeroot. Sandy and mostly damp ground, from N. J., S. and W.; stout herb, 2°–3° high, smooth; leaves linear and tapering, grass-like, parallel-veined in the manner of an endogen, and fringed with bristles; a few globular thick heads in place of umbels, a very short involucre, and white flowers. 2

E. Virginiànum, Lam. Wet grounds from N. J. S.; with lance-linear rather veiny leaves, showing some distinction between blade and petiole, the former with rigid teeth, and involucre longer than the bluish heads. ②

2. **SANÍCULA**, SANICLE, BLACK SNAKEROOT. (Perhaps from Latin *sano*, to heal.) Common in thickets and open woods. Flowers greenish, crowded in small and head-like umbellets, in summer. 2

S. Marilándica, Linn. Stems 2°–3° high; leaves of firm texture, with 3–7 narrow divisions and rigid teeth; umbellets with many flowers, the sterile ones on slender pedicels, fertile ones with styles longer than the prickles of the bur-like fruit.

Var. **Canadénsis**, Torr. Leaves thin, 3–5-parted; umbellets rather few-flowered, with the sterile flowers in the center almost sessile; styles shorter than prickles.

3. **DAÙCUS**, CARROT. (Ancient Greek name.) Flowers in summer.

D. Caròta, Linn. Common C. Cult. from Eu. for the root, run wild and a bad weed E.; leaves cut into fine divisions; umbel concave and dense in fruit, like a bird's nest; involucre of pinnatifid leaves. ① ②

4. **CORIÁNDRUM**, CORIANDER. (Name from Greek word for *bug*, from the bug-like scent.)

C. satìvum, Linn. Cult. from the Orient, for the aromatic coriander-seed; low, with small umbels of few rays; flowers summer. ①

5. **OSMORRHÌZA**, SWEET CICELY. (Greek for *scented root*, the root being sweet-aromatic.) Rich moist woods, common N.; flowers late spring and summer; 1°–2° high. 2 (Lessons, Fig. 385.)

O. longístylis, DC. The smoother species, with the sweeter root, has slender styles, and ovate, cut-toothed, short-pointed leaflets, which are slightly downy.

O. brevístylis, DC. Has conical styles not longer than the breadth of the ovary, and downy-hairy, taper-pointed, almost pinnatifid leaflets.

6. **ERIGÈNIA**, HARBINGER OF SPRING. (Greek: *born in the spring.*) 2

E. bulbòsa, Nutt. An attractive spring flower in rich woods, a half foot or less high, the small flowers with white petals and purple stamens giving the bloom a speckled effect, whence a common name, Pepper and Salt. N. Y., W. and S.

7. **CONÌUM**. POISON HEMLOCK. (Greek name of the Hemlock by which criminals and philosophers were put to death at Athens.)

C. maculàtum, Linn. Spotted H. Waste grounds, run wild, from Eu.; a smooth, branching herb, with spotted stems about 3° high, very compound leaves with lanceolate and pinnatifid leaflets, ill-scented when bruised; a virulent poison, used in medicine; flowers summer. ②

8. SÌUM, WATER PARSNIP. (Old name, of obscure meaning.) 2

S. cicutæfòlium, Gmelin. The common species, in water and wet places; tall, smooth, with grooved-angled stems, simply pinnate leaves, the long leaflets linear or lanceolate, very sharply serrate and taper-pointed, and globular fruit with wing-like, corky ribs; flowers all summer. Root and herbage poisonous.

9. FŒNÍCULUM, FENNEL. (Name from the Latin *fœnum*, hay.)

F. officinàle, All. (or F. VULGÀRE). COMMON F. Cult. from Eu. for the sweet-aromatic foliage and fruit; stout, very smooth herb, 4°–6° high; leaves with very numerous and slender, thread-shaped divisions; large umbel with no involucre or involucels; fruit $\frac{1}{4}'$ or $\frac{1}{3}'$ long, in late summer. 2

10. CICÙTA, WATER HEMLOCK. (Ancient Latin name of the Hemlock.) Flowers summer. 2

C. maculàta, Linn. SPOTTED COWBANE, MUSQUASH ROOT, BEAVER POISON. Tall, smooth stem, sometimes streaked with purple, but seldom really spotted; leaflets lance-oblong, coarsely toothed or sometimes cut-lobed, veiny, the main veins mostly running into the notches; fruit aromatic when bruised; root a deadly poison. Common.

11. ÀPIUM, CELERY. (Old Latin name.)

A. gravèolens, Linn. A strong-scented, acrid, if not poisonous plant, of Eu.; of which the GARDEN CELERY is a state rendered bland, and the base of the leafstalks enlarged, succulent and edible when blanched, through long cultivation; leaves divided into 3–7 coarse and wedge-shaped, cut or lobed leaflets or divisions; umbels and fruits small. Var. RAPÀCEUM, CELERIAC, TURNIP-ROOTED CELERY, is a state with the root enlarged and edible. ① ②

12. CÀRUM, CARAWAY, etc. (Name perhaps from the country, *Caria*.) (Lessons, Fig. 208.)

§ 1. CARAWAY, *with finely pinnately compound leaves, and white flowers.*

C. Cárui, Linn. GARDEN CARAWAY. Cult. from Eu., for the "caraway seed," the oblong, highly aromatic fruit; stem leaves with slender but short, thread-shaped, divisions. This and the next occasionally spontaneous.

§ 2. PARSLEY, *with coarser leaves and greenish flowers.*

C. Petroselìnum, Benth. (or PETROSELÌNUM SATÌVUM). PARSLEY. Cult. from Eu., especially the curled-leaved state, for the pleasant-flavored foliage, used in cookery, chiefly the root leaves, which have ovate and wedge-shaped, 3-lobed and cut-toothed divisions; fruit ovate. ②

13. LEVÍSTICUM, LOVAGE. (Ancient Latin name.) One species. 2

L. officinàle, Koch. GARDEN L. Cult. in old gardens, from Eu.; a tall, very smooth, sweet, aromatic herb, with large ternately or pinnately decompound leaves, coarse wedge-oblong and cut or lobed leaflets, a thick root, and small, many-flowered umbels.

14. ANGÉLICA. (*Angelic*, from reputed cordial properties.) Flowers summer. 2

A. atropurpùrea, Linn. Moist deep soil N.; strong-scented, smooth, with very stout, dark-purple stem, 3°–6° high, large leaves ternately com-

pound, and the divisions with 5–7 pinnate leaflets, which are ovate and cut-serrate; petioles with large, inflated, membranaceous base; flowers greenish-white; fruit smooth and thin-winged.

A. hirsùta, Muhl. Dry ground, commoner S.; stem 2°–5° high, rather slender, downy at top, as are the umbels and broadly winged fruits; leaflets thickish, ovate-oblong, serrate; flowers bright white.

15. HERACLÈUM, COW PARSNIP. (Named after *Hercules.*) Flowers summer. 2

H. lanàtum, Michx. Damp rich ground N.; very stout, 4°–8° high, woolly-hairy when young, unpleasantly strong-scented, with large cut and toothed or lobed leaflets, some of them heart-shaped at base, and broad umbels with white flowers and large fruits.

16. PASTINÀCA, PARSNIP. (Latin name from *pastus*, food.)

P. sativa, Linn. COMMON P. Run wild in low meadows, and then rather poisonous; cult. from Eu. for the esculent strong-scented root. Tall, smooth, with grooved stem, coarse and cut-toothed or lobed leaflets, and umbels of small yellow flowers. ① ②

LV. ARALIACEÆ, GINSENG FAMILY.

Like the foregoing family, but often shrubs or trees, usually more than two styles and cells to the ovary and fruit, the latter a berry or drupe. Besides a few choice and uncommon shrubby house plants, represented only by the two following genera. The flowers in both are more or less polygamous, and the lobes or margin of the calyx very short or none. Petals and stamens 5.

1. ARALIA. Flowers in simple or panicled umbels, white or greenish; the petals lightly overlapping in the bud. Styles 2–5, separate to the base, except in sterile flowers. Leaves compound or decompound. Root, bark, fruit, etc., warm-aromatic or pungent.
2. HEDERA. Flowers in panicled or clustered umbels, greenish; petals valvate in the bud. Ovary 5-celled; the 5 styles united into a conical column. Leaves simple, palmately 3–5-lobed or angled. Woody stems climbing by rootlets.

1. ARÀLIA. (Derivation obscure.) 2

§ 1. WILD SARSAPARILLA, etc. *Flowers perfect or polygamous with both fertile and sterile on the same plant; umbels more than one; fruit black or dark purple, spicy; seeds or cells and styles* 5.

* *Large and leafy-stemmed, with very compound leaves sometimes* 2° *or* 3° *across and with many umbels in a large compound panicle; flowers in summer.*

A. spinòsa, Linn. ANGELICA TREE, HERCULES' CLUB. River banks from Penn. S., and planted; a shrub or low tree, of peculiar aspect, the simple stout trunk rising 6°–20° high and beset with large prickles, bearing immense leaves with ovate serrate leaflets and corymbed or panicled umbels.

A. racemòsa, Linn. SPIKENARD. Woodlands in rich soil, with herbaceous stems 3°–5° high, from a thick aromatic root, not prickly, widely spreading branches, heart-ovate leaflets doubly serrate and slightly downy, and racemed-panicled umbels.

* * *Smaller; short stems scarcely woody at base; few umbels; flowers early summer.*

A. hispida, Vent. Bristly Sarsaparilla. Rocky places; bristly stems 1°–2° high, leafy below, naked and bearing corymbed umbels above; leaves twice pinnate, the leaflets oblong-ovate and cut-toothed.

A. nudicaùlis, Linn. Common Wild S. Low ground; the aromatic, horizontal, slender roots running 3°–5° long, used as a substitute for officinal Sarsaparilla; the smooth, proper stem rising only 2′–4′, bearing a single long-stalked leaf of 5 ovate or oval serrate leaflets on each of the 3 divisions of the petiole, and a short peduncle with 2–7 umbels.

§ 2. Ginseng. *Sterile and fertile flowers usually on separate simple-stemmed plants, in a single slender-stalked umbel, below it a single whorl of digitate leaves; styles and cells of the fruit* 2 *or* 3.

A. quinquefòlia, Dec. & Planch. Ginseng. Root spindle-shaped, warm-aromatic, 4′–9′ long; stem 1° high; leaflets 5 at the end of each of the 3 petioles, slender-stalked, thin, obovate-oblong, pointed, serrate; flowers in summer; fruit red. Rich woods N. Also cult. Medicinal.

A. trifòlia, Dec. & Planch. Dwarf G. or Groundnut. Low woods, N.; 4′–8′ high, from a deep, globular, pungent-tasted root; leaflets 3 or sometimes 5 sessile on the end of each of the 3 petioles, narrow-oblong and obtuse; flowers in spring; fruit orange-yellow.

2. **HÉDERA,** IVY. (The ancient Latin name.) Flowers late summer.

H. Hèlix, Linn. True or English Ivy. Woody climber, with evergreen, glossy, rounded heart-shaped or kidney-shaped and 3-lobed or 3-angled, often variegated leaves, or in some varieties more deeply 3–7-cleft, yellowish-green flowers, and blackish berries; covers shaded walls, etc., adhering by its rootlets, but scarcely hardy N. Eu

LVI. CORNACEÆ, DOGWOOD FAMILY.

Shrubs, trees, or one or two mere herbs, with simple leaves, small, often imperfect flowers, calyx tube in the perfect or pistillate ones coherent with the surface of the 1–2-celled ovary, which is crowned with the small calyx teeth or minute cup, bearing the petals (valvate in the bud), and stamens of the same number; style and stigma single; ovule and seed solitary in the cells, hanging from the summit; fruit a small drupe or berry. Petals sometimes 0.

* *Flowers perfect, in cymes, close clusters, or heads.*

1. CORNUS. Minute teeth of the calyx, petals, and stamens 4. Style slender; stigma terminal. Berry-like little drupe with a 2-celled, 2-seeded stone. Leaves entire, opposite except in one species, deciduous. Bark very bitter, tonic. Flower cluster often subtended by a corolla-like involucre.

* * *Flowers polygamous or dioecious, in axillary clusters or solitary.*

2. AUCUBA. Flowers dioecious, dull purple. Teeth or lobes of the calyx and petals 4. Stamens in the sterile flowers 4, with short filaments and oblong anthers. Fertile flowers with a 1-celled ovary, becoming an oblong, red berry in fruit; style short; stigma capitate. Leaves opposite, coriaceous and glossy, evergreen, smooth, more or less toothed.

3. NYSSA. Flowers polygamous or dicœcious, greenish; the sterile ones numerous, the fertile 2–8 in a bracted cluster, or rarely solitary. Calyx of 5 or more lobes or teeth. Petals small and narrow, or minute, or none. Style slender or awl-shaped, bearing a stigma down the whole length of one side, revolute. Ovary and stone of the drupe 1-celled and 1-seeded. Trees with deciduous alternate leaves, either entire, angled, or few-toothed.

1. CÓRNUS, CORNEL or DOGWOOD. (Latin: *cornu*, horn, from the hardness of the wood.) Flowers late spring and early summer.

* *Flowers greenish, in a head or close cluster surrounded by a showy, corolla-like, (white or rarely pinkish) 4-leaved involucre; fruit bright red.*

C. Canadénsis, Linn. DWARF CORNEL, BUNCHBERRY. Damp woods N.; a low herb, the stems from creeping, subterranean shoots which are slightly woody, bearing 4–6 ovate or oval leaves at the summit below the stalked flower head; petal-like leaves of the involucre ovate; fruits globular, in a cluster, edible.

C. flórida, Linn. FLOWERING DOGWOOD. Rocky woods; also planted for ornament. Tree 12°–30° high, with ovate pointed leaves, petal-like leaves of the whitish (or in a cult. variety red) involucre (1½′ long) obcordate or obovate and notched, and oval fruits in a head.

* * *Flowers yellow (earlier than the leaves), in a small umbel, surrounded by a small and dull-colored involucre of 4 scales; fruit bright red.*

C. Más, Linn. CORNELIAN CHERRY. A tall shrub or low tree, with oval, pointed (often variegated) leaves and handsome oblong fruit, the pulp pleasantly acid; planted from Eu.

* * * *Flowers white in open and flat cymes, without involucre; fruit small, globular, inedible, blue, white, or black.*

+ *Leaves alternate.*

C. alternifòlia, Linn.f. Shrub or tree, 8°–25° high, with streaked branches, ovate or oblong taper-pointed leaves acute at base and only minutely pubescent beneath, crowded at the end of the branches; cymes large and flat; fruit bright blue on reddish stalks. Hillsides and banks of streams.

+ + *Leaves all opposite.*

++ *Branches of the previous year red or purple, at least in spring (rarely yellow in C. stolonifera).*

= *Leaves with lower surface more or less soft-pubescent (rarely smoothish in C. Baileyi).*

C. serícea, Linn. KINNIKINIC (the dry bark smoked by the Indians W.). In wet places N. and S.; has dull-red branches, the shoots, cymes, and lower face of the narrow-ovate or oblong pointed leaves silky-downy; fruit bluish; stone irregular and furrowed, generally broader than long.

C. Bàileyi, Coult. & Evans. An erect shrub, with purple-red branches; leaves lanceolate to ovate, acute; flowers white, in small cymes, often continuing all summer, and followed by pearly-white berries; stone much compressed and prominently furrowed on the edge, broader than long. Along the Great Lakes and far W.

== *Leaves smooth (although often whitish) below, or the pubescence, if any, appressed.*

C. stolonífera, Michx. WILD RED OSIER. Shrub 3°–6° high, in wet places N., spreading by prostrate or subterranean running shoots, smooth,

with ovate, abruptly pointed leaves, small cymes, and lead-colored fruit; stone scarcely compressed, longer than broad.

C. sanguínea, Linn. European Red Osier. Erect, with ovate (sometimes variegated) leaves rather downy beneath, and black or dark purple fruit; planted from Eu.

+ + Branches brownish, gray, or green-streaked.

= Leaves loosely pubescent below.

C. asperifòlia, Michx. Shrub 3°–5° high, with branches and small oblong or ovate leaves pubescent, upper face of the latter rough, the lower downy; cymes small and flat; fruit bluish. Dry soil, Lake Erie W. and S.

C. circinàta, L'Her. Shrub 3°–10° high, with warty-dotted branches; rather large round-oval and short-pointed leaves downy beneath; small flat cymes, and light-blue fruit. Wooded hillsides, Va. and Mo., N.

= = Leaves scarcely pubescent below.

C. strícta, Lam. Shrub 8°–15° high, with ovate or lance-ovate taper-pointed leaves, smooth and green both sides; loose flat cymes, and pale blue fruit. Wet grounds S.

C. paniculàta, L'Her. Shrub 3°–8° high, much branched, smooth, with ash-colored bark, lance-ovate pointed leaves, acute at base and whitish beneath, and proportionally large and numerous convex cymes, often panicled; fruit white. Roadsides and copses, N.

2. AÙCUBA. (Japanese name of the species cultivated as a house-plant.)

A. Japónica, Thunb. Shrub, with large ovate-oblong leaves bright green and usually marbled with yellow; the flowers inconspicuous, but the red berries (when formed) handsome.

3. NÝSSA, TUPELO, PEPPERIDGE, SOUR GUM TREE. (Greek name of a nymph, the trees growing in wet places.) Flowers spring.

** Sterile flowers in loose clusters; fruit blue, not edible.*

N. sylvática, Marsh. Common Tupelo, Sour Gum, Pepperidge. In swamps or rich woods, N. and S.; tree 30°–50° high, with horizontal branches and Beech-like spray; ovate or obovate leaves entire and smooth or glossy when old; fertile flowers 3–8 on the slender peduncle; dark-blue oval fruit ½′ long, and ovoid scarcely ridged stone; wood tough; leaves changing to bright crimson in autumn.

N. biflòra, Walt. Water Tupelo. In pine-barren swamps, N. J., S.; smaller leaves than in the preceding (1′–2′ long) and varying from lance-oblong to roundish; short peduncles, the fertile 1–2-flowered; smaller oval fruit and a flattened ridged stone.

N. uniflòra, Wang. Large Tupelo, Wild Olive. In water, from Va. and Ill., S.; large tree, with leaves ovate or oblong, acute, often with a few sharp teeth, 4′–6′ long, on slender petioles, downy beneath; fertile peduncles long and 1-flowered; fruit oblong, about 1′ long; stone flattened, with very sharp ridges; wood soft; roots very spongy, used for corks.

** * Sterile flowers in a head; oblong fruit red and edible.*

N. Ogèche, Marsh. Ogeechee Lime or Wild Lime, so called from the acid fruit (1′ or more long); in swamps far S.; a small tree, with oblong or obovate leaves (3′–5′ long) downy beneath; fertile flowers solitary on very short peduncles.

II. Monopetalous Division.

Includes the families which have both calyx and corolla, and the latter in one piece; that is, the petals united more or less into one body. Yet in some plants, especially the compositæ, the calyx is so much reduced or modified as to appear to be wanting; and in a few others, as some of the Ericaceæ, the petals are separate.

LVII. CAPRIFOLIACEÆ, HONEYSUCKLE FAMILY.

Shrubs, or rarely herbs, with calyx adherent to the 2–5 celled ovary (the teeth or limb above it sometimes nearly obsolete or obscure), stamens as many as the lobes of the corolla (or in Adoxa twice as many, and in Linnæa one fewer) and borne on its tube, and opposite leaves without stipules. In some species of Viburnum there are little appendages on the base of the petiole imitating stipules. Fruit a drupe or berry, or sometimes a pod. Seeds with a small embryo in fleshy albumen.

* *Corolla shallow, wheel-shaped or urn-shaped; stigmas* 3–5 (*sometimes* 1 *in Viburnum*). *Fruit a dryish or fleshy drupe.*

\+ *Herbs; flowers capitate.*

1. ADOXA. Low, with a single pair of ternate, cauline leaves. A pair of separate or united stamens with 1-celled anthers in each sinus of the 4–6-cleft, greenish or yellowish, small corolla. Fruit dry, with 3–5 nutlets.

\+ \+ *Shrubs or some low trees, with small flowers in broad cymes, and berry-like fruit, containing* 1–3 *seeds or rather seed-like stones. Calyx-teeth on the ovary very short or obscure; stamens* 5.

2. VIBURNUM. Leaves simple. Fruit containing a single flat or flattish stone.
3. SAMBUCUS. Leaves pinnate, and the oblong or lanceolate leaflets serrate. Fruit containing 3 seeds or rather small, seed-like stones.

* * *Corolla longer or tubular, frequently irregular, sometimes* 2-*lipped; stigma* 1.

\+ *Perennial herbs, with prominent awl shaped or linear lobes to the calyx, and axillary flowers.*

4. LINNÆA. A pair of flowers nodding on the summit of a slender, scape-like peduncle. Corolla narrow, bell-shaped, with 5 almost equal, rounded lobes. Stamens 4, two of them shorter. Ovary and small pod 3-celled, but perfecting a seed in only one cell. Creeping evergreen herb.
5. TRIOSTEUM. Flowers sessile in the axils of the leaves, single or in a cluster. Corolla oblong-tubular, with 5 short, almost equal lobes, scarcely longer than the leaf-like lobes of the calyx. Stamens 5, equal. Fruit fleshy, orange or red, crowned with the persistent calyx-lobes, containing 3 bony seeds or rather nutlets. Erect and coarse, leafy herbs; their leaves narrowed at base, but united around the simple stem.

+ + Shrubby, with cymose or axillary flowers.

++ Teeth of the calyx very short on the 2 4-celled ovary; fruit a berry; leaves simple, entire or rarely wavy or lobed on some vigorous young shoots.

6. SYMPHORICARPUS. Flowers small, in close clusters or interrupted spikes. Corolla bell-shaped, with 4 or 5 equal roundish lobes and as many short stamens in the throat. Ovary 4-celled, but the berry only 2-seeded, two cells being empty. Low upright shrubs, with oval, short-petioled leaves.

7. LONICERA. Corolla tubular, funnel-form, or oblong, more or less irregular, being gibbous or bulging on one side at base, and the 5 lobes not all alike, but in one species nearly so. Stamens 5. Ovary 2–3-celled, becoming a several-seeded berry. Twining or upright shrubs.

++ ++ Teeth or lobes of the calyx slender, on the summit of the slender or taper-pointed ovary which becomes a many-seeded, 2-valved pod; leaves simple, serrate.

8. DIERVILLA. Corolla funnel-form, almost regular, 5-lobed. Stamens 5. Ovary narrow, sometimes linear and stalk-like. Low upright shrubs, with flowers in terminal or axillary loose clusters or cymes.

1. ADÓXA. (Greek: *obscure*). 2*l*

A. Moschatéllina, Linn. Radical leaves 1–3-ternate, the stem leaves cleft or parted; leaflets obovate; head of flowers on a slender peduncle. Wis., W. and N.

2. VIBÚRNUM, ARROWWOOD. (Ancient name, of uncertain meaning.) Flowers white, or nearly so, in spring or early summer.

** Flowers all alike, small, and perfect.*

+– Leaves not lobed nor coarsely toothed, smooth or with some scurf; fruit black or with a bluish bloom.

+– + Leaves glossy, finely and evenly serrate with very sharp teeth.

V. Lentàgo, Linn. SWEET V., SHEEPBERRY. Tree 10°–30° high, common in moist grounds, chiefly N.; leaves ovate, conspicuously pointed, on long-margined petioles; cyme broad, sessile; fruit oval, ½′ or more long, sweet, edible.

V. prunifòlium, Linn. BLACK HAW. Hardly so tall as the preceding, with smaller and oval mostly blunt leaves. Dry soil, from Conn. to Kans. and S.

+– + + Leaves thick and rugose, dull, finely serrate.

V. Lantàna, Linn. WAYFARING TREE. Tall shrub, with short ovate-cordate leaves, the lower surface and petioles and cymes scurfy-pubescent; fruit red, becoming black. Eu. Cult. here under the name of V. RUGÒSUM.

+– + + + Leaves entire or with a few wavy or crenate small teeth, thickish.

= Cyme more or less peduncled.

|| Leaf edges ciliate.

V. Tìnus, Linn. LAURESTINUS. Cult. from S. Eu., with evergreen smooth entire leaves; not hardy N.; a common house plant, winter-flowering, or planted out in summer; leaves oblong; fruit dark purple.

|| || Leaf edges not ciliate.

V. cassinoìdes, Linn. WITHE-ROD. Leaves thickish and dull, ovate-oblong, the point bluntish, obscurely veiny and often irregularly crenate-denticulate; peduncle short and leafy; shoots scurfy. Wet grounds, N.

V. nùdum, Linn. Much like the last, but leaves more veiny and shining above, less scurfy, the peduncle generally as long as the cyme; flowers later. N. J., S.

= = *Cyme sessile, small.*

V. obovàtum, Walt. In swamps, Va. and S., growing 8° high; leaves small, obovate, or spatulate, obtuse, entire or denticulate and thickish.

+ + *Leaves coarsely toothed, strongly feather-veined; the veins prominently marked, straight and simple, or nearly so; fruit small; cyme peduncled.*

++ *Leaves slender-petioled; stone sulcate.*

V. dentàtum, Linn. Arrowwood (the stems having been used by the Indians to make arrows). Common in wet soil; 5°–10° high; smooth, with ash-colored bark, pale and broadly ovate, evenly sharp-toothed leaves on slender petioles, and bright blue fruit.

V. mólle, Michx. Soft-downy, with less sharply toothed oval or obovate leaves, and blue oily fruit. N. Eng. to Tex.

++ ++ *Leaves nearly sessile; stone flat.*

V. pubéscens, Pursh. A low and straggling shrub, with ovate or oblong and acute or taper-pointed leaves, having rather few coarse teeth, their lower surface and the very short petioles soft-downy; fruit dark purple. Canada to Ga. and W.

+ + + *Leaves both coarsely toothed and somewhat 3-lobed, roundish, 3–5-ribbed from the base and veiny; cymes slender-peduncled, small.*

V. acerifòlium, Linn. Maple-leaved A. or Dockmackie. Shrub 3°–6° high, in rocky woods, with 3-ribbed and 3-lobed leaves soft-downy beneath, their pointed lobes diverging; stamens slender; fruit black.

V. pauciflòrum, Pylaie. Almost smooth leaves 5-ribbed at base and 3-lobed at summit; cyme few-flowered; stamens shorter than corolla; fruit sour, red. Cold woods, far N.

* * *Flowers round the margin of the cyme neutral (without stamens or pistils) and very much larger than the fertile ones, Hydrangea-like and showy (in cultivation, all becoming neutral); petioles bearing evident appendages which imitate stipules.*

+ *Leaves 3-lobed.*

V. Ópulus, Linn. Cranberry Tree. Tall and nearly smooth shrub, with gray bark, scaly buds, 3–5-ribbed leaves, the lobes pointed and commonly few-toothed; cymes peduncled. The wild form in low grounds N. and E.; the juicy acid fruit bright red, used as a substitute for cranberries (whence the name of High Bush Cranberry). The cultivated form from Eu., planted for ornament, under the name of Guelder-rose or Snowball Tree, has all the flowers changed into enlarged corollas.

+ + *Leaves not lobed.*

V. lantanoìdes, Michx. Hobblebush (popular name from the straggling or reclining branches taking root at the end, and forming loops). Cold moist woods N., with naked buds; large round-ovate leaves, heart-shaped at base and abruptly pointed at the apex, closely serrate, and pinnately many-veined; the veins and netted veinlets prominent underneath and covered, like the stalks and branchlets, with rusty scurf; cymes showy, very broad, sessile; fruit not edible, coral-red turning crimson.

V. tomentòsum, Thunb. (V. plicàtum). Japanese Snowball. Shrub of medium size, with broad-ovate or obovate, plicate, shallow-toothed leaves; axillary dense heads of sterile flowers whiter and more delicate than those of the Common Snowball. China and Japan.

3. **SAMBÙCUS**, ELDER. (From Greek name of an ancient musical instrument, supposed to have been made of Elder stalks.)

* *Flowers in a flattish cyme.*

S. Canadénsis, Linn. Common Elder. Stems woody only towards the base, 5°–6° high, with white pith ; 7–11 oblong smooth or smoothish leaflets, the lowermost often 3-parted ; flowers scentless, in early summer ; fruit small, black-purple. Rich soils.

S. nìgra, Linn. European E. Taller and more woody (where hardy), the leaflets usually 5, oblong-oval or ovate-lanceolate ; flowers larger, faintly sweet scented ; fruit black. Cult. from Eu., chiefly in the form of golden-leaved, variegated, and cut-leaved varieties.

* * *Flowers in a pyramidal panicle or thyrse.*

S. racemòsa, Linn. Red E. Rocky woods chiefly N., with woody stems and warty bark ; yellow-brown pith ; few lanceolate leaflets downy underneath ; berries bright red. Blooms in early spring.

4. **LINNÆA**, TWIN FLOWER. (*Linnæus.*) 2

L. boreàlis, Gronov. Stems creeping, bearing round-oval and sparingly crenate, somewhat hairy, small leaves, and in early summer the sweet-scented pretty flowers ; corolla purple and whitish, hairy inside. Mossy woods and cold bogs N.

5. **TRIÓSTEUM**, FEVERWORT, HORSE GENTIAN. (Greek for *three bones*, from the 3 bony seeds or stones.) The root has been used in medicine, and the seeds for coffee. In rich soil ; flowering early summer.

T. perfoliàtum, Linn. Softly hairy, 2°–4° high, with oval leaves abruptly narrowed at base, and brownish purple flowers in clusters ; the common species.

T. angustifòlium, Linn. Smaller and bristly-hairy, with narrower lanceolate leaves more tapering at base, and greenish or cream-colored flowers, mostly solitary. Va. to Ill., S. and W.

6. **SYMPHORICÁRPOS**. (Greek : *crowded fruits.*) Wild on rocky banks, and cult. for the ornamental, insipid berries. Flowers white or slightly rose-color, produced all summer.

S. racemòsus, Michx. Snowberry. Clusters of flowers in interrupted leafy spikes (rather than racemes) terminating the branches ; corolla bearded within ; style (as in the next) glabrous ; berries snow-white in autumn. N. Eng., S. and W. Common in gardens.

S. occidentàlis, Hook. Wolfberry. Flowers in dense terminal and axillary spikes ; corolla larger than in the last, much bearded within ; berries white. Mich., W.

S. vulgàris, Michx. Coral Berry, Indian Currant. Short clusters of flowers in the axils of most of the leaves ; corolla slightly bearded, but style prominently so ; berries small, dark-red. N. Y., W. and S.

7. **LONICÈRA**, HONEYSUCKLE, WOODBINE. (Named for an old German herbalist, *Lonitzer*, latinized *Lonicerus.*)

§ 1. Fly Honeysuckles, *upright or straggling bushes, never twining, with leaves all distinct to the base, and a pair of flowers on the summit of an axillary peduncle, the* 2 *berries sometimes united into* 1.

* *Four large leafy bracts surrounding* 2 *cylindrical* (¾′ *long*) *yellowish flowers.*

L. involucràta, Banks. Wild from Lake Superior to Cal., and sparingly planted ; shrub 2°–5° high, downy when young, with ovate or

oblong leaves, 3′–5′ long, on short petioles, clammy flowers, and berries quite separate.

* * *The 2 or 4 bracts under the ovaries small or minute, sometimes caducous.*

+ *Flowers appearing before the leaves.*

L. fragrantíssima, Lindl. Branches smooth; flowers white or tinted, sessile at the nodes, strongly 2-lipped, very fragrant; leaves thickish and veiny, short-obovate, with cusp at tip, smooth. China. Foliage evergreen in favorable localities.

L. Standíshii, Hook. Much like the last, but branches retrorsely hairy, and leaves ovate-lanceolate and ciliate and more deciduous. China.

+ + *Flowers appearing with or after the leaves.*

++ *Flowers nearly sessile.*

L. cærùlea, Linn. Leaves oval, downy when young; corolla 5-lobed, yellowish; bracts awl-like, longer than the united ovaries; double berry blue. Cold woods and bogs N.; also cult.

++ ++ *Flowers conspicuously peduncled.*

L. Tatárica, Linn. Tartarian H. Strong growing tall shrub, now commonly planted from Asia; leaves cordate-oval, obtuse or acute, with chaste whitish or bluish-red flowers in profusion, followed by united red berries.

L. ciliàta, Muhl. Straggling, 3°–5° high; oval or oblong and partly heart-shaped leaves, thin and downy beneath when young, and ciliate on the edge; honey-yellow corolla (¾′ long), with short, nearly equal lobes and very unequal-sided base; berries red, separate; flowers early spring. N.

L. oblongifòlia, Muhl. Upright, 2°–5° high; leaves oblong; peduncles long and slender; corolla deeply 2-lipped (½′ long) in early summer; bracts minute or deciduous; berries united, red or purple. Swamps, N.

§ 2. True Honeysuckles, *with twining stems (in one wild species only slightly so).*

* *Corolla with very long tube and 5 short, almost regular lobes.*

L. sempérvirens, Ait. Trumpet H. Wild from N. Y., S., and commonly cult. Leaves evergreen (as the name denotes) only at the S., thickish, pale beneath, the lower oblong, the uppermost pairs united round the stem; flowers scentless, in spiked whorls 2′ long, scarlet with yellow inside (also a yellow variety), produced all summer; berries red.

* * *Corolla strongly 2-lipped; lower lip narrow, upper one broad and 4-lobed.*

+ *The 1 to 4 uppermost pairs of leaves united round the stem in the form of an oval or rounded disk or shallow cup, the flowers sessile in their axils, or partly in leafless spiked whorls beyond* (Lessons, Fig. 163); *berries red or orange.*

++ *Corolla long (1′ or more), glabrous within.*

L. gràta, Ait. American Woodbine. Leaves smooth, glaucous beneath, obovate, the 2 or 3 upper pairs united; flowers white, with a pink or purple slender tube, fading to yellowish, fragrant, the corolla not gibbous at the base, whorled in the upper axils. N. J. to Mich., S. and W.; also cult.

L. Caprifòlium, Linn. Leaves obovate, obtuse or slightly acute, very glaucous, uppermost 2 or 3 pairs connate; flowers yellow with a bluish, very slender, not gibbous tube, in capitate whorls. Cult. from Eu.; flowers only in early summer.

++ ++ *Corolla mostly shorter, hairy within.*

= *Foliage conspicuously glaucous.*

L. Sullivántii, Gray. Leaves large, smooth, and oval or ovate-oblong, sessile, and most of those on the flowering stems connate (the uppermost forming a saucer-like disk), very glaucous; flowers pale yellow, very slightly gibbous below, in a somewhat loose cluster; filaments nearly glabrous. Ohio, W. and S.; also cult., as L. FLÀVA and L. CANADÉNSIS.

L. glaùca, Hill. Leaves oblong, less glaucous than the last and sometimes puberulent beneath, the 1–4 upper pairs connate; flowers smaller than the last ($\frac{1}{3}$′ or less long), purplish or greenish, in a small compact cluster, more gibbous below; filaments hairy. N. Eng. W.

= = *Foliage green or very nearly so, hairy.*

L. hirsùta, Eaton. HAIRY H. Leaves large and broad-oval, dull and veiny, downy and somewhat whitened below, about 2 of the upper pairs connate; flowers in loose whorls, orange-yellow and clammy pubescent; the tube slightly gibbous. Woods, Me., W.

+ + *Leaves all separate and short-stalked.*

L. Periclỳmenum, Linn. (L. BÉLGICA.) Leaves ovate, obtuse, attenuated at the base, sometimes downy, glaucous beneath; flowers red outside and buff within, ringent, disposed in terminal heads. Eu. Some varieties bloom throughout the summer.

L. Japónica, Thunb. (L. CONFÙSA; also L. BRACHÝPODA, L. FLEXUÒSA, and L. HALLIÀNA of gardens.) JAPANESE H. Long-trailing or climbing vine with variable foliage; leaves (sometimes variegated) generally ovate and blunt, but sometimes acute, thin (but nearly evergreen in favorable localities), and more or less hairy, at least when young, never glaucous; slender stems hairy; flowers long (2′), hairy, white or reddish outside, fading to yellow, fragrant at nightfall. Common; from Japan and China.

8. DIERVÍLLA, BUSH HONEYSUCKLE, WEIGELA. (Named for *Dr. Dierville,* who took the common species from Canada to France.)

* *Corolla pale or honey-yellow, and slender funnel-form, not showy; pod oblong.*

D. trífida, Moench. Common N.; 1°–4° high, with oblong-ovate, taper-pointed leaves on distinct petioles, mostly 3-flowered peduncles, and slender, pointed pods; flowers all summer. Banks.

D. sessilifòlia, Buckley. Along the Alleghanies S.; has lance-ovate, sessile leaves, many-flowered peduncles, and short-pointed pods.

* * *Corolla showy, mostly rose-colored, funnel-form, with an abruptly narrowed base; very slender, stalk-like ovary and linear pod. Species much confused, but the following are the sources of the garden* WEIGELAS. *From Japan and China.*

D. flórida, Sieb. & Zucc. Known under many names, as WEIGÈLA and DIERVILLA RÒSEA, D. AMÁBILIS, W. ÁLBA, W. ÍSALÌNÆ, etc. Calyx teeth lanceolate; corolla rose-color; seeds wingless and triangular; leaves ovate-lanceolate, serrate; 5°–8°. Common in cult.

D. Japónica, DC. (D. HORTÉNSIS.) Usually lower; calyx teeth linear; corolla rose-color, the tube broadly funnel-shaped; seeds (as in the two next) winged; plant more or less hairy, the under side of the young leaves especially so; flowers numerous, nearly or quite sessile.

D. grandiflòra, Sieb. & Zucc. Larger, 5°–10° or sometimes even more, with linear calyx teeth, plant glabrous or very nearly so, the leaves much larger than in the last; the creamy (becoming rose) flowers on com-

monly distinct, more or less elongated peduncles; corolla tube broadly funnel-shaped.

D. floribúnda, Sieb. & Zucc. (D. VERSÍCOLOR and D. MULTIFLÒRA). Calyx teeth linear; corolla tube narrowly funnel-shaped; flowers brownish or at first greenish, becoming purplish; leaves villous; ovary and calyx hairy.

LVIII. RUBIACEÆ, MADDER FAMILY.

Like the preceding family, but with stipules between the opposite (or sometimes ternately whorled) entire leaves, or else (as in Galium) the leaves whorled without stipules. Fruit a capsule or berry. An immense family in the tropics, and here represented by several wild and a few commonly cultivated species. The CINCHONA or PERUVIAN BARK trees belong here; also COFFEE, of which the best known species is COFFÈA ARÁBICA, a shrub or small tree, sometimes cult. in conservatories, with smooth and glossy oblong leaves, bearing fragrant white flowers in their axils, followed by the red berries, containing the pair of seeds.

* *Leaves opposite, with stipules; ovules numerous in each cell.*

\+ *Low herbs.*

1. HOUSTONIA. Corolla salver-form or funnel-form, the 4 lobes valvate in the bud. Stamens 4. Style 1; stigmas 2. Pod short, 2-celled, the upper part rising more or less free from the 4-lobed calyx, opening across the top, and ripening rather few (4–20 in each cell) saucer-shaped or thimble-shaped pitted seeds. Stipules short and entire, sometimes a mere margin connecting the bases of the opposite leaves. Flowers more or less dimorphous.
2. OLDENLANDIA. Like Houstonia, but corolla mostly wheel-shaped, and the seeds angular and very numerous.

\+ \+ *Shrubs or trees.*

3. PINCKNEYA. Flowers in a terminal compound cyme. Calyx with 5 lobes, 4 of them small and lanceolate, the fifth often transformed into a large bright rose-colored leaf. Corolla hairy, with a slender tube and 5 oblong-linear recurving lobes. Stamens 5, protruding. Fruit a globular 2-celled pod, filled with very many thin-winged seeds.
4. GARDENIA. Flowers solitary at the end of the branches or nearly so, large, very fragrant. Calyx with 5 or more somewhat leaf-like lobes. Corolla funnel-shaped or salver-shaped, with 5 or more spreading lobes convolute in the bud, and as many linear anthers sessile in its throat. Style 1; stigma of 2 thick lobes. Fruit fleshy, surmounted by the calyx lobes, ribbed down the sides, many-seeded.
5. BOUVARDIA. Flowers in clusters at the end of the branches. Calyx with 4 slender lobes. Corolla with a long and slender or somewhat trumpet-shaped tube, and 4 short, spreading lobes, valvate in the bud. Anthers 4, almost sessile in the throat. Style 1; stigma of 2 flat lips. Pod small, globular, 2-celled. Seeds wing-margined.

* * *Leaves opposite or in* 3*'s or* 4*'s, with stipules; ovule solitary in each cell.*

\+ *Low herbs or creepers, with narrow funnel-form or salver-form corolla, its lobes (valvate in the bud) and the stamens* 4.

6. DIODIA. Flowers 1–3, sessile in the axils of the narrow leaves. Stipules sheathing, dry, fringed with long bristles. Ovary 2- (rarely 3-), celled, in fruit splitting into 2 hard and dry closed nutlets. **Calyx teeth 2–5, often unequal.**

7. SPERMACOCE. Flowers sessile, in axillary whorls or clusters. Fruit small and dry, 2-celled, one or both of the carpels opening (1 carpel, in falling, usually carrying the partition with it, leaving the other open). Calyx teeth 4.

8. MITCHELLA. Flowers in pairs at the end of branches, the two ovaries united into one, which in fruit forms a 2-eyed scarlet berry. Corolla densely white-bearded inside, white or purplish-tinged outside. Style 1; stigmas 4, slender. Seeds, or rather little stones, 4 to each of the two flowers. Stipules small, not fringed.

\+ + *Shrubs or small trees; lobes of the corolla overlapping in the bud.*

9. CEPHALANTHUS. Flowers many and small, crowded in a close, round head, raised on a peduncle. Calyx 4-toothed. Corolla tubular with 4 very short lobes. Stamens 4. Style long and much protruded, tipped with a capitate stigma. Fruit small, dry and hard, inversely pyramidal, at length splitting into 2 or 4 closed, 1-seeded portions.

* * * *Leaves whorled, without stipules; ovules solitary.*

10. GALIUM. Flowers small or minute, mostly in clusters, with a wheel-shaped, 4-parted (or sometimes 3-parted) corolla, and as many short stamens. Ovary 2-celled, forming a small and twin, fleshy or berry-like, or else dry and sometimes bur-like, 2-seeded fruit. Styles 2. Calyx above the ovary obsolete. Slender herbs, with square stems, their angles and the edges of the leaves often rough or almost prickly.

1. HOUSTÒNIA. (*Dr. Wm. Houston*, an English physician, who botanized on the coast of Mexico, where he died early.)

* *Delicate little plants, with 1-flowered peduncles, flowering from early spring to summer; corolla salver-form; pod somewhat 2-lobed, its upper half free; seeds with a deep hole occupying the face.*

H. cærùlea, Linn. COMMON H. or BLUETS. Moist banks and grassy places; 3′–5′ high, smooth and slender, erect, with oblong or spatulate leaves only 3″ or 4″ long, very slender peduncle, and light blue, purplish, or almost white and yellowish-eyed corolla, its tube much longer than the lobes. ②

H. mínima, Beck. Roughish, 1′–4′ high, at length much branched and spreading; leaves ovate, spatulate, or the upper linear; earlier peduncles slender, the rest short, and tube of the purplish corolla not longer than its lobes and those of the calyx. Dry hills from Mo., S. W. ① ②

H. rotundifòlia, Michx. Prostrate and creeping leafy stems; peduncles shorter than the roundish leaves and recurved in fruit; corolla white. Sandy soil from N. Car., S. 2

* * *Erect leafy-stemmed, 5′–20′ high, with flowers in terminal clusters or cymes, in summer; corolla funnel-form; seeds rather saucer-shaped.* 2

H. purpùrea, Linn. Wooded or rocky banks, commoner W.; smooth or slightly downy, with ovate or lanceolate 3–5-ribbed leaves; pale-purple flowers, and upper half of globular pod free from the calyx. Variable.

Var. **ciliolàta**, Gray. 3′ high, with thick small stem leaves, and oval or oblong ciliate radical leaves. W.

Var. **longifòlia**, Gray. The common one N.; slender or low, with 1-ribbed leaves, those of the stem varying from lance-oblong to linear.

H. angustifòlia, Michx. Stems tufted erect; narrow-linear and acute 1-ribbed leaves; crowded short-pediceled flowers with lobes of the white corolla densely bearded inside, and only the top of the obovate pod rising above the calyx. Dry banks from Ill., S. and W.

2. OLDENLÁNDIA. (*H. B. Oldenland* was a German botanist who died at the Cape of Good Hope.)

O. Bóscii, Chapm. 3′ or 4′ high, diffuse, glabrous; leaves linear; flowers few or solitary; calyx teeth broadly subulate, mostly shorter than the capsule. S. Car., S. and W. 2

O. glomeràta, Michx. Taller, erect, or becoming diffuse, somewhat pubescent; leaves ovate or oblong; flowers generally in clusters; calyx lobes ovate or oblong and leafy, longer than the capsule. N. Y., S. and W. ①

3. PINCKNÈYA, GEORGIA BARK or FEVER TREE. (Named for *Chas. C. Pinckney.*)

P. pùbens, Michx. The only species; a rather downy small tree or shrub, in wet pine barrens, S. Car. to Ga., with large oval leaves, slender stipules, and purplish flowers of little beauty, but the great calyx leaf commonly produced is striking.

4. GARDÈNIA, CAPE JESSAMINE. (Named for *Dr. Garden* of S. Car., who corresponded with Linnæus.)

G. jasminoìdes, Ellis. (G. FLÓRIDA). A house plant from China and Japan; 2°–4° high; leaves smooth and bright-green, oblong acute at both ends; large and showy, very fragrant flowers; the white corolla 5–9-lobed, or full double; berry large, oblong, orange-colored, 5–6-angled and tapering at the base.

5. BOUVÁRDIA. (*Dr. Chas. Bouvard*, director of the Paris Garden of Plants over a century ago.) Favorite conservatory plants of several species, the following from Mexico, best known:

B. triphýlla, Salisb. Shrubby or half-shrubby, blossoming through the winter, and in grounds in summer; with leaves ovate or oblong-ovate, smoothish, in 3's or the upper in pairs; corolla scarlet, minutely downy outside, nearly 1′ long.

B. leiántha, Benth. Winter-blooming, has more downy leaves and smooth, deep-scarlet corolla.

6. DIÒDIA, BUTTONWEED. (Greek: *a thoroughfare*, being humble weeds, often growing by the wayside.) Flowers white or whitish.

D. Virginiàna, Linn. Stems spreading, 1°–2° long; leaves broadly lanceolate, sessile; corolla salver-shaped, ½′ long; style 2-parted; fruit oblong, crowned with 2 calyx teeth. N. J., S. ♃

D. tères, Walt. Sandy fields from N. J. and Ill., S.; with slender stems 3′–9′ long; linear and rigid leaves; small corolla rather shorter than the long bristles of the stipules, undivided style, and obovate little fruit crowned with the 4 short calyx teeth. ①

7. SPERMACÒCE. (Greek, referring to the *pointed carpels.*) Several species far S.

S. glàbra, Michx. Glabrous; stems spreading a foot or two; leaves oblong-lanceolate; heads of small whitish flowers many-flowered and axillary. Ohio, S. and W. ♃

8. MITCHÉLLA, PARTRIDGE BERRY, SQUAWBERRY. (Named for *Dr. J. Mitchell*, an early botanist of Va.) ♃

M. rèpens, Linn. A little herb, creeping over the ground, with the small, evergreen leaves round-ovate, very smooth and glossy, bright green, sometimes with whitish lines, short-petioled; flowers pretty and sweet-scented; fruit scarlet, remaining over winter, edible. Woods, N. and S.

9. CEPHALÁNTHUS, BUTTONBUSH. (Greek: *head* and *flower.*) Flowers summer and autumn. (Lessons, Fig. 205.)

C. occidentàlis, Linn. A tall shrub, common along the borders of ponds and streams, with lance-oblong or ovate-pointed leaves on petioles, either in pairs or 3's, and with short stipules between them; the head of white flowers about 1′ in diameter.

10. GÀLIUM, BEDSTRAW, CLEAVERS or CLIVERS. (Greek: *milk*, which some species in Eu. were used to curdle.) There are other species in our region, some introduced from Eu. (Lessons, Fig. 183.)

* *Fruit dry when ripe, small.*

+– *Fruit smooth; leaves with strong midrib but no side ribs or nerves, in 4's, 5's, or 6's; flowers white, loosely clustered at the end of spreading branches.* 2

G. aspréllum, Michx. Low thickets; 3°–5° high; the backwardly prickly-roughened angles of the stem and edges and midrib of the lance-oblong pointed leaves adhering to contiguous plants; leaves in whorls of 6 on the stem and of 4 or 5 on the branchlets; flowers numerous.

G. trífidum, Linn. Swamps and low grounds; 6′–2° high; roughish or sometimes nearly smooth; leaves varying from linear to oblong, 4–6 in the whorls; flowers rather few, their parts often 3.

+– +– *Fruit smooth or slightly bristly; leaves 3-nerved; flowers white in a narrow and long terminal panicle.* 2

G. boreàle, Linn. 1°–2° high; smooth, erect, with lance-linear leaves in 4's. Rocky banks of streams N.

+– +– +– *Fruit a little bur, being covered with hooked prickles.*

++ *Leaves mostly 6 or 8 in a whorl, with midrib and no side nerves; flowers whitish or greenish; stems reclining or prostrate, bristly-rough backwards on the angles.*

G. Aparìne, Linn. CLEAVERS or GOOSE GRASS. Leaves in 8's, lanceolate, rough-edged, 1′–2′ long; peduncles axillary, 1–2-flowered; fruit large. Low grounds. ①

G. triflòrum, Michx. Leaves mostly in 6's, lance-oblong, bristle-pointed; peduncles terminating the branches, 3-flowered. Sweet-scented in drying. Woodlands, especially N. 2

++ ++ *Leaves all in fours, more or less 3-nerved; flowers not white; stems ascending, about 1° high, rather simple, not prickly-roughened.* 2

G. pilòsum, Ait. Leaves oval, dotted, downy, 1′ long; flowers brown-purple or cream-colored, all pediceled, the peduncle 2–3-times forked. Commonest S., in dry thickets. Var. **puncticulòsum** is a smooth form S.

G. circæzans, Michx. WILD LIQUORICE, the root being sweetish; leaves oval or oblong, obtuse, ciliate; peduncles once forked, their long branches bearing short-pediceled dull or brownish flowers along the sides, the fruit reflexed. Common.

G. lanceolàtum, Torr. Like the preceding, but with lanceolate or lance-ovate tapering leaves, 2′ long. N.

* * *Fruit a black berry; the parts of the white flower only* 4. *Only in Southern States, in dry, sandy soil.* 2

G. hispídulum, Michx. Stems spreading 1°–2° long; leaves in 4's, ½′ or less in length, lance-ovate; peduncle 1–3-flowered; berry roughish.

G. uniflòrum, Michx. Smooth, slender, 1° high; leaves linear; flowers mostly solitary.

LIX. VALERIANACEÆ, VALERIAN FAMILY.

Herbs, with opposite leaves, no stipules, calyx coherent with the ovary, which has only one fertile, one-ovuled cell but two abortive or empty ones, and stamens always fewer than the lobes of the tubular or funnel-form corolla (1–3, distinct), and inserted on its tube. Style slender; stigmas 1–3. Fruit small and dry, indehiscent; the single hanging seed with a large embryo and no albumen. Flowers small, in clusters or cymes.

* *Lobes of the calyx many and slender, but hardly seen when in flower, being rolled up inwards around the base of the corolla; in fruit they unroll and appear as long plumose bristles, resembling a pappus, like thistle-down.*

1. VALERIANA. Corolla with narrow or funnel-form tube usually gibbous at the base on one side, but not spurred, its 5 spreading lobes almost equal. Stamens 3. Akene 1-celled, the minute empty cells early disappearing. Root strong-scented.

* * *Lobes of the calyx of a few short teeth or mostly hardly any.*

2. VALERIANELLA. Corolla funnel-form, with 5 equal or rather unequal spreading lobes. Stamens mostly 3. Akene-like fruit with one fertile and two empty cells, or the latter confluent into one.

1. VALERIÀNA, VALERIAN. (Name obscure.) Flowers early summer, often dicœcious, white or purplish. ♃

* *Root fibrous or rhizomatous; leaves rather thin.*

+ *Garden species from Eu., producing the medicinal Valerian-root.*

V. officinàlis, Linn. The commonest in gardens; 2°–3° high, a little downy, with leaves of 11 to 21 lanceolate or oblong cut-toothed leaflets, and rootstocks not running.

V. Phù, Linn. Smooth, with root leaves simple, stem leaves of 5–7 entire leaflets or lobes, and rootstock horizontal.

+ + *Wild species N. and chiefly W.; all rather rare or local.*

V. pauciflòra, Michx. 1°–2° high, smooth, with thin ovate and heart-shaped toothed root leaves, stem leaves of 3–7 ovate leaflets; flowers rather few in the crowded panicled cyme; corolla long and slender. Woodlands, Penn. to Ill. and S. W.

V. sylvática, Banks. Root leaves mostly ovate or oblong and entire, stem leaves with 5–11 lance-oblong or ovate almost entire leaflets; corolla funnel-form. Cedar swamps N.

* * *Root a spindle-shaped tuber; leaves thickish, more simple.*

V. édulis, Nutt. 1°–4° high, the large root eaten by the Indians W.; leaves mostly from the root and minutely woolly on the edges, those of the root lanceolate or spatulate, of the stem cut into 3–7 long and narrow divisions. Alluvial ground from O. W.

2. VALERIANÉLLA (or FÈDIA), CORN SALAD, LAMB'S LETTUCE. (Diminutive of *Valeriana*.) Our species are all very much alike in appearance, smooth, with forking stems 6′–20′ high; tender,

oblong leaves either entire or cut-lobed towards the base, and small flowers in clusters or close cymes, with leafy bracts, and a short white or whitish corolla, in early summer. ① ②

V. olitòria, Poll. Corn Salad. Corolla bluish; fruit broader than long, and a thick corky mass at the back of the fertile cell. Eu.; cult. and sparingly naturalized.

V. chenopodifòlia, DC. Corolla whitish; fruit ovate-triangular, mostly smooth, shaped like a grain of buckwheat when dry, the confluent empty cells occupying one angle, and much smaller than the broad and flat seed. N. Y., W. and S.

V. radiàta, Dufr. Corolla whitish; fruit mostly downy and somewhat 4-angled, the parallel, narrow, empty cells contiguous, but with a broad, shallow groove between them. Penn. and Mich. S.

LX. DIPSACEÆ, TEASEL FAMILY.

Differs from the preceding family by having the flowers strictly in heads, surrounded by an involucre, as in the next family, — from which it differs in the separate stamens, hanging seed, etc. All are natives of the Old World.

1. DIPSACUS. Coarse and stout herbs, with stems and midrib of leaves often prickly, and the heads with rigid prickly-pointed bracts or chaff under each flower, under the whole a conspicuous leafy involucre. Each flower has an involucel in the form of a little calyx-like body inclosing the ovary and akene. Calyx continued beyond the ovary into a mere truncate, short cup-like, border. Corolla slender, with 4 short lobes. Stamens 4. Style slender.
2. SCABIOSA. Less coarse, not prickly; the short heads surrounded by a softer green involucre; a short scale or soft bristle for a bract under each flower. Corolla funnel-form, 4–5-cleft, oblique or irregular; the outer ones often enlarged. Stamens 4. Style slender. Involucel inclosing the ovary and the calyx various.

1. DÍPSACUS, TEASEL. (Greek: *to thirst;* the united bases of the leaves in some species catch rain water.) Flowers summer.

D. sylvéstris, Mill. Stem 4°–5° high, prickly, with lance-oblong leaves, the upper ones united round the stem; heads large, oblong; corollas purplish or lilac; slender-pointed, straight chaff under each flower. ② Along roads.

D. Fullònum, Linn. Fuller's T. Less prickly than the other, with involucre hardly longer than the flowers, the awn-like tips of the rigid chaff hooked at the end, which makes the *teasel* useful for carding woollen cloth; cultivated in central N. Y. for this purpose, sometimes escaping into waste places and roadsides. ②

2. SCABIÒSA, SCABIOUS. (Latin name.) Flowers summer. One European species is commonly cultivated for ornament, —

S. atropurpùrea, Linn. Sweet S. Or when with dark purple or crimson flowers, called Mourning Bride; the flowers are sometimes rose-colored or even white; plant 1°–2° high, with obovate or spatulate and toothed root leaves, pinnately-parted stem leaves, the cup or involucel inclosing the ovary 8-grooved, calyx proper with 5 long bristles surmounting the akene: outer corollas enlarged. ①

LXI. COMPOSITÆ, COMPOSITE FAMILY.

Herbs, or a very few shrubs, known at once by the "compound flower," as it was termed by the older botanists, this consisting of several or many flowers in a head, surrounded by a set of bracts (formerly likened to a calyx) forming an *involucre*, the stamens as many as the lobes of the corolla (almost always 5) and inserted on its tube, their *anthers syngenesious*, i.e. united in a ring or tube through which the style passes. (Lessons, Figs. 290, 291.) Calyx with its tube incorporated with the surface of the ovary, its limb or border (named the *pappus*) consisting of bristles, either rigid or downy, or of teeth, awns, scales, etc., or of a cup or crown, or often none at all. (Lessons, Figs. 379–384.) Corollas either tubular or funnel-form and lobed, or strap-shaped (*ligulate*), or sometimes both sorts in the same head, when the outermost or marginal row has the strap-shaped corollas, forming *rays* (which answered to the corolla of the supposed compound flower), the separate flowers therefore called *ray flowers;* those of the rest of the head, or *disk*, called *disk flowers*. The dilated end of the stalk or branch upon which the flowers are borne is called the *receptacle*. The bracts, if there are any, on the receptacle (one behind each flower) are called the *chaff* of the receptacle. The bracts or leaves of the involucre outside the flowers are commonly called *scales*. Style 2-cleft at the apex. Ovary 1-celled, containing a single ovule, erect from its base, in fruit becoming an akene. Seed filled by the embryo alone. (For the flowers, and the particular terms used in describing them, see Lessons, pp. 93, 94, Figs. 266–269; for the fruit, see p. 121, Figs. 379–384.)

The largest family of Flowering Plants, generally too difficult for the beginner; but most of the common kinds, both wild and cultivated, are here briefly sketched. For fuller details as to the wild ones, with all the species, the student will consult the Manual, and Chapman's Southern Flora. The following synopsis is arranged to aid the beginner, but the genera are numbered in systematic sequence.

Series I. Head with only the outermost flowers strap-shaped, and these never perfect, i.e. they are either pistillate

or neutral, always without stamens; or with strap-shaped corollas entirely wanting. Plants destitute of milky or colored juice. (Series II., p. 228.)

A. *No strap-shaped corollas or true rays;* i.e. *the head discoid.* (**B**, p. 224.)

* *Branches of the style filiform-subulate and rough all over with minute bristles; receptacle not chaffy; flowers not yellow* (* * and * * * this page).

1. VERNONIA. Heads corymbed, with an involucre of many imbricated scales, and 15 to 30 or more rose-purple flowers. Lobes of the corolla slender. Akenes cylindrical, several-ribbed; pappus of copious hair-like bristles, surrounded at base by an outer set of very short and fine scales or scale-like bristles. Leaves alternate.

* * *Branches of the style long and slender or mostly rather club-shaped, obtuse, usually very minutely puberulent under a lens, the stigmatic surface below the middle; receptacle not chaffy; flowers not yellow.*

\+ *Pappus* 0; *leaves opposite.*

2. PIQUERIA. Heads very small, of 3–5 whitish flowers, and involucre of 4 or 5 imbricated scales. Akene 4–5-angled.

\+ \+ *Pappus stiff, mostly scale-like; leaves whorled or opposite.*

3. SCLEROLEPIS. Heads many-flowered, flesh-colored, the scales of the involucre equal. Corolla 5-toothed. Akenes 5-angled. Pappus a single row of 5 hard, oval, obtuse scales. Leaves whorled.
4. AGERATUM. Heads small and few-flowered, blue (in ours; in others rose-colored), with a cup-shaped involucre of imbricated narrow bracts; receptacle flattish; the pappus of a few chaffy scales, mostly tapering into a slender stiff rough bristle. Leaves opposite.

\+ \+ \+ *Pappus of slender bristles; leaves various.*

\+\+ *Stem twining; involucral scales* 4.

5. MIKANIA. Heads of 4 flesh-colored flowers. Corolla 5-toothed. Akenes 5-angled; pappus a row of hair-like, naked (barely roughish) bristles. Leaves opposite.

\+\+ \+\+ *Stem erect; involucral scales more than* 4.

6. EUPATORIUM. Heads of 3 or more flowers, and an involucre of several or many scales. Corolla 5-toothed. Receptacle flat or merely convex. Akenes 5-angled; pappus a row of hair-like naked (rarely rough) bristles. Leaves alternate, opposite, or whorled.
7. KUHNIA. Heads small, of 10–25 dull cream-colored flowers, surrounded by a few lanceolate scales of the involucre. Corolla slender, barely 5-toothed. Akenes cylindrical, many-striate; pappus a row of white plumose bristles. Leaves mostly alternate.
8. LIATRIS. Heads of several or many rose-purple flowers, surrounded by a more or less imbricated involucre. Lobes of the corolla rather long. Akenes slender, about 10-ribbed; pappus of many long and slender bristles, which are plumose or else beset with a short beard or roughness for their whole length. Heads spicate or racemose. Leaves alternate, entire, often resinous-dotted.

* * * *Branches of the style mostly short, often united, with obtuse or truncate tips, naked or sometimes hairy appendaged (or even with a minute hairy tip), the stigmatic surface either extending to the tip or to an appendage; receptacle either naked or chaffy; flowers of many colors.*

\+ *Thistles or Thistle-like, the heads with very many flowers, all alike and mostly perfect. Branches of the style short or united, even to the tip. Scales of the involucre many-ranked, these or the leaves commonly tipped with prickly or bristly points.*

\+\+ *Pappus of many long plumed bristles; receptacle with bristles between the flowers.*

(65) CNICUS. Scales of the involucre not fleshy-thickened, prickly-tipped or else merely pointed. Akenes flattish, not ribbed. Filaments of the stamens separate.

66. CYNARA. Scales of the involucre of the great heads thickened and fleshy towards the base, commonly notched at the end, with or without a prickle. Akenes slightly ribbed. Otherwise much as in the last.

++ ++ Pappus of naked, rough, or short-barbed bristles, or none.

64. ARCTIUM. Scales of the globular involucre abruptly tipped with a spreading, slender, awl-shaped appendage, mostly hooked at its point. Receptacle bristly. Akenes flattened, wrinkled; pappus of many short and rough bristles, their bases not united, deciduous. Leaves and stalks not prickly.

68. CARTHAMUS. Outer scales of the involucre leaf-like and spreading, middle ones with ovate appendage fringed with spiny teeth or little spines, innermost entire and sharp-pointed. Receptacle beset with linear chaff. Akenes very smooth, 4-ribbed; pappus none. Leaves with rigid or short spiny teeth.

(67) CENTAUREA; see + +

+ + Thistle-like, with many-ranked imbricated scales to the involucre, many flowers, and the two branches of the style united into one body almost or quite to the tip, as in + ; but the outer flowers of the head different from the rest and sterile except in a few kinds of Centaurea. Receptacle beset with bristles.

65. CNICUS. Outer flowers smaller than the rest, slender-tubular, sterile. Scales of the involucre tipped with a long, spine-like appendage which is spiny-fringed down the sides. Akenes short-cylindrical, many-ribbed, and grooved, crowned with 10 short and horny teeth, within which is a pappus of 10 long and rigid and 10 short naked bristles. Leaves prickly-toothed.

67. CENTAUREA. Outer flowers sterile and with corolla larger than the rest, often funnel-shaped and with long, sometimes irregular lobes, forming a kind of false ray; but these are wanting in a few species. Involucre various, but the scales commonly with fringed, sometimes with spiny tips. Akenes flat or flattish; pappus of several or many bristles or narrow scales, or none.

+ + + Bur-like or achenium-like in the fruit, which is a completely closed involucre containing only one or two flowers, consisting of a pistil only, with barely a rudiment of corolla, therefore very different from most plants of the family; but the staminate flowers are several and in a flat or top-shaped involucre. Heads therefore monœcious, or rarely diœcious; no pappus. Coarse and homely weeds.

32. AMBROSIA. Heads of staminate flowers in racemes or spikes terminating the stems or branches, their involucre of several scales united in a flattish or top-shaped cup; fertile flowers clustered below the staminate, only one inclosed in each small achenium-like involucre, which is naked, or with a few tubercles or strong points near the top in a single row.

33. XANTHIUM. Heads of staminate flowers in short racemes or spikes, their involucre of several scales in one row; fertile flowers below them, clustered in the axils, two together in a 2-celled hooked prickly bur.

+ + + + Plants not thistle-like, spiny, nor bur-like in their fruits, heads, or herbage.

++ Two kinds of flowers in the same head, the outer ones with pistils only.

= Pappus none, or a minute border or cup.

‖ No chaff among the flowers; scales of the involucre dry, often with scarious margins, imbricated. Bitter-aromatic or rather acrid plants.

53. TANACETUM. Heads of many yellow flowers; the marginal ones with pistil only and a 3–5-toothed corolla. Akenes angled or ribbed, with a flat top, crowned with a cup-like, toothed or lobed pappus. Very strong-scented herbs, with heads in a corymb.

54. ARTEMISIA. Heads small, of few or many yellow or dull purplish flowers, some of the marginal ones pistillate and fertile, the others perfect, but sometimes not maturing the ovary. Akenes obovate or club-shaped, small at the top, destitute of pappus. Bitter-aromatic and strong-scented plants, with heads in panicles.

(52) CHRYSANTHEMUM. One species, of old yards, is discoid (p. 226).

‖‖ *Chaffy receptacle; scales of the involucre dry and very stiff, in many series, often colored.*

63. XERANTHEMUM. Heads large and solitary, long-peduncled. Involucre campanulate or cylindrical, the scales spreading, the outer ones shorter. Akene slender, with a minute crown. Hoary.

‖‖‖ *Chaffy receptacle; scales of the involucre green, few, and rounded.*

31. IVA. Heads small and few–several-flowered, the outer 1–4 pistillate and fertile, with a small tubular corolla or 0, the others staminate with a funnel-form, 5-toothed corolla. Anthers nearly separate. Akenes ovoid or lenticular. Pappus 0.

= = *Pappus none at all to the outer pistillate and fertile flowers, but of some slender bristles in the central and perfect, yet seldom fruit-bearing flowers; scales of the involucre woolly.*

20. FILAGO. Heads small, crowded in close clusters, of many inconspicuous flowers, each fertile pistillate flower in the axil of a thin and dry chaffy scale, and with a very slender, thread-like corolla; the central flowers with a more expanded 4–5-toothed corolla. Low herbs, clothed with cottony wool; leaves entire.

= = = *Pappus of all the flowers composed of bristles (but caducous in Grindelia); no chaff among the flowers.*

‖ *Cottony-white herbs.*

21. GNAPHALIUM. Small heads (often clustered) of many whitish flowers, surrounded by an involucre of many ranks of dry and white or otherwise colored (not green) scarious and persistent scales woolly at base; the flowers all fertile, the outer ones with pistil and very slender corolla, the central ones perfect and with more expanded 5-toothed corolla. Pappus a row of very slender and roughish bristles.

(22) ANTENNARIA. Like Gnaphalium, but the plants dicœcious. Staminate flowers with a simple style, but the ovary sterile, and their pappus of stouter bristles which are thickened at the summit, and there more or less barbed or plumed; pappus of fertile flowers united and falling together.

23. ANAPHALIS. Heads dicœcious or nearly so. Pappus not thickened or united. Fertile heads usually bearing a few perfect but sterile flowers in the center. Otherwise like Antennaria.

‖‖ *Not cottony.*

(9) GRINDELIA, which is sometimes rayless, may be sought here (p. 226).

25. HELICHRYSUM. Heads rather large, terminating the branches singly, the pistillate flowers few and often in a single marginal row. Involucre dry and chaff-like, not cottony, the scales stiff and spreading, often colored.

19. PLUCHEA. Heads many-flowered, the central flowers perfect but sterile, these few, with a 5-cleft corolla; all other flowers pistillate and fertile, with a thread-shaped truncate corolla. Involucre imbricated. Anthers with tails. Akenes grooved. Pappus in a single row. Strong-scented herbs, near the coast.

61. ERECHTITES. Heads of many whitish flowers, with a cylindrical involucre of many narrow and naked scales in a single row; outer flowers with very slender corolla: inner with more open tubular corolla. Akenes narrow; pappus of copious, very fine and soft, naked, white hairs. Rank coarse herb.

(11) ERIGERON. One species has such short and inconspicuous rays that it may be looked for here (p. 225).

++ ++ *Only one kind of flowers in the head.*

– *Scales of the involucre dry and papery or scarious, often colored (i.e., not green), not withering, in many ranks; many flowers in the head.*

‖ *Plant dicœcious: head containing only staminate or pistillate flowers.*

22. ANTENNARIA. Pistillate flowers with very slender corollas and a pappus of long and very fine, hair-like, naked bristles; the staminate (with a simple imperfect style), with the pappus of thicker bristles enlarging and somewhat plumed or barbed at their summit. Leaves and stems cottony.

(23) ANAPHALIS. See above.

18. BACCHARIS. Corolla of the pistillate flowers very slender and thread-like; of the staminate flowers, larger and 5-lobed. Anthers tailless. Akenes ribbed. Pappus in the fertile flower long and abundant; in the staminate, scanty and tortuous. Smooth or glutinous herbs near the coast.

‖ ‖ *Flowers perfect.*

24. HELIPTERUM. Flowers with open 5-toothed yellowish corollas. Involucre (silvery rose-colored), smooth obovate, or top-shaped. Akenes woolly; pappus of numerous plumose bristles. Leaves and stems smooth and naked.

26. AMMOBIUM. Flowers with yellow 5-lobed corollas, surrounded by a silvery-white involucre. Chaffy scales on the receptacle among the flowers. Akenes flattish-4-sided; pappus of 4 teeth, 2 of them prolonged into a bristle. Leaves and stems white-cottony, the latter with leaf-like wings.

(52) CHRYSANTHEMUM. One species is sometimes rayless, and with flowers all alike from the suppression of the ligulate pistillate ray flowers (p. 226).

= = *Scales of the involucre not dry and scarious or papery (i.e., they wilt); flowers all perfect.*

‖ *Flowers yellow, with chaff between them; akenes flat, bearing 2–4 awns or bristles.*

(43, 44) COREOPSIS and BIDENS (p. 227). A few species have no ray flowers.

‖ ‖ *Flowers yellow, no chaff; akenes not flat; pappus of copious, very soft and fine, down-like bristles.*

(57) SENECIO. One or two species are destitute of ray flowers (p. 225); also (11) SOLIDAGO (p. 225).

‖ ‖ ‖ *Flowers not yellow; no chaff.*

59. EMILIA. Heads rather small, but with many orange-red disk flowers in a very simple cup-shaped involucre with no small outer scales. Akenes with 5 acute and hispid-ciliate angles. Very closely related to Senecio (p. 225).

60. CACALIA. Heads corymbed, with 5–30 white or whitish flowers. Scales of the involucre a single row, with a few small bractlets at base. Corolla 5-cleft. Branches of the style smooth, with a conical or flat usually minutely hairy tip. Akenes oblong, smooth; pappus of very many fine and soft, down-like, naked bristles. Leaves alternate.

(12) BELLIS. A cultivated state with *quilled* (monstrous) flowers may be sought here (p. 225).

B. *With strap-shaped corollas or rays at the margin of the head.* (*Discoid variations may occur.*)

* *Herbage, involucres, etc., dotted with large pellucid or colored glands or oil receptacles imbedded in their substance, making the plants strong-scented; involucre of one row of scales united into a bell-shaped or cylindrical cup; no chaff on the flattish receptacle; flowers yellow or orange.*

48. DYSODIA. Rays pistillate, mostly short. Involucre with some loose bractlets at the base. Receptacle not chaffy, but clothed with short chaffy bristles. Akenes slender, 4-angled; pappus a row of chaffy scales dissected into numerous rough bristles, so as to appear at first sight as if capillary. Leaves opposite.

49. TAGETES. Rays pistillate. Involucre without bractlets at base. Akenes elongated, flat, somewhat 4-sided; pappus of two or more unequal rigid chaffy scales, often united into a tube or cup, sometimes tapering into awns. Herbs, very glabrous.

* * *Herbage not spotted with large translucent or colored, strong-scented glands.*

\+ *Pappus of copious hair-like bristles; no chaff on the receptacle among the flowers.*

\+\+ *Rays yellow, except in one or two species of Senecio and one Solidago, pistillate.*

= *Anthers caudate or appendaged at the base.*

27. INULA. Ray flowers very numerous in one row, with narrow ligules. Outer scales of the involucre leaf-like. Pappus of many slender roughish bristles. Akenes narrow. Heads large and broad, the tubular perfect flowers very numerous, their anthers with two tails at the base. Leaves alternate.

= = *Anthers not truly appendaged.*

‖ *Leaves all radical, appearing after the vernal flowers.*

55. TUSSILAGO. Ray flowers very numerous and in many rows, fertile, with narrow ligules; the tubular disk flowers few in the center, and not fertile. Scale of the involucre nearly in one row. Pappus fine and soft. Head solitary on a scaly-bracted scape.

‖ ‖ *Leafy-stemmed, later flowering.*

○ *Involucre imbricated.*

10. CHRYSOPSIS. Ray flowers numerous in one row. Scales of the involucre narrow, not leaf-like. Pappus of many roughish slender bristles, with also an outer row of very short and stout or chaff-like bristles. Akenes flattened, hairy. Heads single or corymbed. Leaves alternate.

11. SOLIDAGO. Ray flowers 1–8, or rarely 10–16, the tubular disk flowers several, rarely many. Involucre oblong, its scales appressed, of unequal lengths. Pappus a single row of slender roughish bristles. Akenes narrow and terete, many-ribbed. Heads in large clusters, panicled or corymbed, small. Leaves alternate.

○ ○ *Involucre not (or very slightly) imbricated.*

56. ARNICA. Ray flowers several or many in a single row. Scales of the involucre nearly equal in 2 rows. Pappus a single row of rough rather rigid bristles. Akenes slender. Heads few and rather large. Leaves opposite.

57. SENECIO. Ray flowers several in a single row, or sometimes none; the disk flowers (as in the last three) perfect and fertile. Scales of the involucre in a single row, or often with small bractlets at the base. Pappus very fine and soft. Heads mostly in corymbs. Leaves alternate, simple or compound.

58. OTHONNOPSIS. Ray flowers few, in one series. Disk flowers all sterile. Involucre campanulate (in ours), the scales in one row, more or less united at the base. Akenes of ray flowers oblong, 5–10-ribbed, pubescent, crowned with the copious pappus in several or many rows; of the disk flowers slender, glabrous, the pappus less. Leaves fleshy.

+ + + + *Rays white, blue or purple (at least never yellow), the flowers of the disk mostly yellow. Akenes flattish. Leaves simple and alternate.*

14. CALLISTEPHUS. Ray flowers very numerous, usually in more than one row, in cultivation often very numerous. Involucre in several rows, more or less leafy. Pappus of many slender and roughish bristles, surrounded at base by a little cup or crown, consisting of many little scales or short stiff bristles more or less united. Heads solitary terminating leafy stems or branches, large and broad. Leaves sessile, coarsely toothed. Annual.

15. SERICOCARPUS. Ray flowers about 5, white, fertile; disk flowers 12–20, pale yellow. Involucre cylindrical or clavate, the scales loosely imbricated in several rows, whitish and appressed, often with greenish spreading tips. Akenes short and obpyramidal, very silky. Pappus simple, of numerous capillary bristles. Perennials, with sessile leaves and mostly clustered heads.

16. ASTER. Ray flowers more or less numerous, in one row. Involucre imbricated. Pappus of very numerous slender roughish bristles; no cup or crown of short bristles outside. Heads usually panicled or corymbed. Usually perennial.

17. ERIGERON. Ray flowers numerous, narrow, and commonly occupying more than one row. Involucre more simple than in Aster, the scales narrower, appressed, mostly of equal length and occupying only one or two rows, without any leaf-like tips; and the pappus more scanty, often some minute short and sometimes chaff-like bristles at the base of the long ones. Annual or perennial.

+ – + *Pappus not of long hair-like bristles, either a little cup or crown, or of a few scales, teeth, awns, etc., or none at all.*

+ + *No chaff on the receptacle among the flowers, except perhaps in Achillea and Anthemis and in some cultivated and altered forms of Chrysanthemum. Leaves mostly alternate.*

= *Akenes flat; rays (pistillate) not yellow, at least in our species.*

12. BELLIS. Heads with numerous white, reddish, or purple rays. Receptacle high, conical. Akenes flat, obovate, wingless; no pappus. Low herbs, with solitary peduncled heads, and entire or merely toothed leaves.

13. BOLTONIA. Flowers resembling those of Aster and Erigeron. Receptacle conical or hemispherical. Akenes very flat, obovate or obcordate with a callous margin or wing; pappus of several minute and short bristles, and commonly 2 or 3 short awns. Leafy-stemmed, tall, branching herbs, with pale-green thickish and chiefly entire leaves often turned edgewise.

51. ACHILLEA. Heads mostly with few and white (rarely rose-red or yellow) rays. Receptacle small, flattish, chaffy. Akenes oblong, margined; no pappus.

= = *Akenes incurved or boat-shaped, rough-tubercled on the back; no pappus; rays numerous in more than one row; flowers all yellow or orange.*

62. CALENDULA. Heads showy, solitary, terminating the branches, with the very numerous rays pistillate and fertile, expanding in sunshine or bright daylight; the disk flowers sometimes few in the center and sterile. Involucre of numerous short green scales. Receptacle flat. Akenes (all that mature) belonging to the ray flowers, strongly incurved, some of them even horseshoe-shaped, or coiled into a ring, and (especially the outer ones) with thickened margins.

= = = *Akenes not flat, nor boat-shaped; rays pistillate and fertile except sometimes in Anthemis and Gaillardia, often yellow.*

‖ *Pappus a short crown, or none.*

50. ANTHEMIS. Rays pistillate and fertile (or neutral in one), numerous, white or sometimes yellow. Involucre of many small, close-pressed scales. Receptacle convex, with some slender chaff, at least at the center. Akenes terete, mostly ribbed. Leaves once to thrice pinnately divided.

52. CHRYSANTHEMUM. Rays pistillate and fertile, numerous. Receptacle convex or flat, without chaff, except in some double-flowered varieties. Disk flowers mostly with a flattened tube. Pappus none. Otherwise nearly as in Anthemis.

‖ ‖ *Pappus of 5–10 conspicuous thin chaffy scales with midrib more or less extended into a bristle or awn, or of a few rigid, caducous awns; rays not very numerous, yellow or partly reddish or brownish-purple, never white.*

9. GRINDELIA. Heads large and many-flowered, rarely rayless. Scales of the involucre in several rows or series, the tips green and more or less spreading, often resinous. Akenes short and thick, truncate, glabrous. Pappus of a few rigid awns, caducous. Leaves alternate.

46. HELENIUM. Rays pistillate. Involucre of a few small and narrow spreading or reflexed scales. Receptacle globular or conical. Heads mostly corymbed. Akene top-shaped and ribbed. Pappus of 5–8, 1-nerved and thin chaffy scales. (Lessons, Fig. 382.)

47. GAILLARDIA. Rays often neutral, often party-colored. Involucre of two or more rows of loose, leafy-tipped scales. Receptacle convex. Disk flowers often purple; the styles with very slender hispid branches. Heads solitary on slender terminal peduncles. Akene top-shaped and 5-ribbed, villous. Pappus of 5–10 long and thin scales.

++ ++ *Chaff on the receptacle, one bract behind each flower in the head.*

= *Disk flowers, even if apparently perfect, always sterile, only the ray flowers fertile or maturing their akenes; flowers all yellow. Coarse tall herbs.*

‖ *Flowers yellow or yellowish.*

28. POLYMNIA. Heads rather small or middle-sized, with about 5 leaf-like scales to the involucre, and some thin and small inner ones, few or several ray flowers producing turgid obovate or partly triangular akenes with no pappus. Herbage clammy-pubescent and rather strong-scented; all but the uppermost leaves opposite, and their petioles winged or dilated and stipule-like at the clasping base.

29. SILPHIUM. Heads mostly large, with numerous, somewhat leafy-tipped or green scales to the involucre imbricated in 2 or more rows, numerous ray flowers producing very broad and flat akenes (parallel with the scales of the involucre), which have commonly a wing-like margin and 2 teeth or a notch at the top. Juice resinous.

‖ ‖ *Flowers whitish.*

30. PARTHENIUM. Heads small, many-flowered; the rays 5, usually inconspicuous, with very short and broad obcordate limbs not projecting beyond the woolly disk. Involucre hemispherical, with two rows of short or roundish scales. Akenes obcompressed, with a slender callous margin, crowned with the persisting ray corolla and the pappus of two small chaffy scales.

= = *Disk flowers perfect and fertile, those of the ray pistillate and fertile, or neutral.*

(*Centaurea may be sought here;* see p. 222.)

‖ *Akenes flattened parallel with the scales of the involucre and chaff of the receptacle, or in* 44 *sometimes very slender. Leaves generally opposite; involucre double, the outer mostly leafy like, the inner of erect scales.*

42. DAHLIA. Ray in the natural flowers neutral or in the common species more or less pistillate, but in the gardens most or all of the flowers are changed into rays. Inner involucre of numerous more or less united scales. Akenes oblong, obscurely 2-horned or notched at the apex.

43. COREOPSIS. Rays usually 8, neutral, mostly yellow, or brown-purple at base. Involucre commonly of about 8 outer loose or leaf-like scales and as many erect inner ones. Chaff slender, deciduous with the flat akenes, which have mostly a pappus of 2 teeth or awns, the latter not barbed downwards.

44. BIDENS. Like Coreopsis, but several without rays, and some with slender or needle-shaped akenes; all bear 2 or more rigid persistent awns, which are barbed downwards.

45. COSMOS. Differs from Bidens in having the akenes distinctly beaked, and the rays (in ours) purple or rose-color.

‖ ‖ *Akenes flattened laterally (if at all), i.e., contrary to the scales of the involucre and the chaff of the receptacle, the latter usually embracing or folded round their outer margin.*

o *Rays deciduous after flowering, usually yellow; native.*

× *Receptacle flat or convex.*

39. HELIANTHUS. Rays several or many, neutral. Scales of the involucre imbricated. Receptacle flat or convex. Akenes flattish, but more or less 4-angled or lenticular, marginless; pappus of 2 thin chaffy scales corresponding with the outer and inner angle of the akene, and sometimes with minute intermediate ones, all deciduous from the ripe fruit. (Lessons, Fig. 381.) Leaves simple, entire or serrate; stems not winged.

40. VERBESINA. Rays few (in ours 1–5), pistillate. Involucre of few erect scales. Receptacle rather flat. Akenes flat, winged or wingless; pappus of 2 persistent awns. Leaves simple, decurrent into wings on the stem.

41. ACTINOMERIS. Rays neutral, few or several. Involucre of several nearly equal scales. Receptacle convex or conical. Akenes flat, oval, wing-margined; pappus of 2 persistent smooth awns. Leaves simple, serrate, often decurrent into wings on the stem.

× × *Receptacle high and columnar.*

38. LEPACHYS. Like Rudbeckia (next page), but akenes flattened, wing-margined on the inner and sometimes on the outer edge, 1–2-toothed at summit. Disk grayish. Chaff short and truncate. Leaves alternate, pinnately compound.

o o *Rays persistent on the fruit, becoming dry and papery, broad, pistillate and fertile, of various colors; exotic.*

34. ZINNIA. Rays several. Receptacle conical; the oblong chaff not longer than the velvety-tipped disk corollas. Akenes oblong or linear, flattened, or those of the ray 3-sided; pappus of a chaffy awn or tooth on each angle, or sometimes hardly any. Leaves opposite, sessile, and entire. Heads solitary, terminating the stem or branches.

‖ ‖ ‖ *Akenes not flattened, but angled or cornered.*

(50, 51) ANTHEMIS and ACHILLEA, in which the receptacle is sometimes chaffy, may be sought here (p. 226).

35. HELIOPSIS. Rays 10 or more, pistillate. Scales of the involucre in 2 or 3 rows, the inner shorter than the disk. Receptacle conical. Akenes 4-angled, somewhat cubical; no pappus. Leaves opposite, petioled, triple-ribbed.

36. ECHINACEA. Rays numerous, rather persistent, long, drooping, pistillate but sterile, rose-purple. Scales of the involucre narrow and spreading. Receptacle conical; the persistent and rigid spiny-tipped chaff longer than the purplish disk corollas. Akenes thick and short, 4-sided, and with a toothed border for a pappus. Leaves chiefly alternate, 3–5-ribbed.

37. RUDBECKIA. Rays several or numerous, neutral. Yellow scales of the involucre in about 2 rows, spreading. Receptacle conical or columnar. Chaff soft. Akenes short, 4-angular, marginless, flat at the top; pappus none or a short even cup or border. Leaves alternate.

Series II. Head with all the flowers strap-shaped and perfect. Juice milky. Leaves alternate.

* *No pappus.*

69. LAMPSANA. Heads small, 8–12-flowered, loosely panicled. Involucre cylindrical, with 8 scales in a single row. Akene oblong. Flowers yellow.

* * *Pappus of both chaff and bristles, or of chaffy scales alone which form a crown or cup on top of the akene.*

70. KRIGIA. Heads medium to large, terminating naked scapes or branches, yellow. Scales of the involucre in two more or less defined rows. Akene short and truncate, top-shaped or column-like, terete or angled. Pappus double, the outer row of thin chaffy scales, the inner of slender bristles. Leaves mostly radical.

71. CICHORIUM. Head of several blue flowers. Involucre double; the outer of 5 short and spreading, the inner of about 10 erect scales. Akenes short, with broad summit. Pappus of small chaffy scales. Stems twiggy, leafy mostly towards the base. (Lessons, Figs. 266, 267; the akene, Fig. 380.)

* * * *Pappus of rather numerous and stout long-plumose bristles.*

72. TRAGOPOGON. Head large, of many yellow or purplish flowers. Involucre of about 12 lanceolate rather fleshy scales in a single row, somewhat united at the base. Akenes terete, slender, roughish, tapering into a long beak, which bears the rigid long-plumed bristles of the pappus, 5 of these longer and naked at the summit. Stems leafy; leaves entire, parallel-veined, clasping at the base.

73. LEONTODON. Head rather small, of many yellow flowers. Involucre of many narrow equal erect scales, and a few short bractlets at base. Akenes spindle-shaped; pappus a single row of tawny plumose bristles. Leaves all at the root, or base of the scapes.

* * * * *Pappus many slender, but rather stiff and rough, tawny, not plumose bristles.*

74. HIERACIUM. Heads small or smallish, of 12 or more yellow flowers. Scales of the involucre unequal and in more than one row. Akenes short, oblong or columnar, not beaked; the fragile bristles of the pappus not very copious. Stems naked or leafy.

75. PRENANTHES. Heads usually nodding, of 5–40 greenish-white or yellowish, often purple-tinged flowers. Involucre cylindrical, of 5–15 linear scales in a single row and a few short bractlets at base. Akenes cylindrical; pappus of very copious straw-colored or brownish bristles. Stems leafy.

* * * * * *Pappus of extremely copious, and fine, soft, hair-like, not plumose, bristles.*

+ *Mature akenes with the pappus raised on a very slender (short in some Lactucas) stalk-like beak.*

76. PYRRHOPAPPUS. Head of yellow flowers as in the next; but the pappus rusty red and with a minute ring of soft down underneath it. Stems branching and leafy near the base, the long peduncles naked.

77. TARAXACUM. Head of very many yellow flowers on a slender, hollow, and wholly naked scape. Involucre double, the inner of numerous narrow scales in a single row, the outer of short loose scales. Akenes terete or spindle-shaped, strongly ribbed and tubercled on the ribs, much shorter than its slender beak which elevates at maturity the soft and white pappus. (Lessons, Fig. 384.)

78. CHONDRILLA. Heads few-flowered, small, yellow. Involucre cylindrical, of several very narrow equal scales, and a row of small bracts at the base. Akene terete, several-ribbed, rough above but smooth below. Pappus bright white. Wand-like herbs.

79. LACTUCA. Heads of several variously colored flowers. Involucre of several lanceolate or ovate imbricated scales of unequal length. Akenes flat, abruptly contracted into the beak or neck which elevates the very white soft pappus. Stems leafy.

++ *Akenes beakless.*

80. SONCHUS. Involucre as in the last, or with narrow and more equal scales, and tumid at base. Flowers yellow. Akene flat and short, without a beak to support its very soft white pappus. Stems branching and leafy. (Lessons, Fig. 383.)

1. VERNÒNIA, IRONWEED. (Named for a *Wm. Vernon*, of England, who traveled in this country.) Flowers autumn. 2

* *Leaves slightly or not at all scabrous, not revolute.*

V. Noveboracénsis, Willd. COMMON IRONWEED. Near the coast and along rivers W.; 3°–6° high, with lanceolate serrate leaves, crowded along the whole height of the stem; heads in a broad cyme; scales of involucre with slender awl-shaped or awn-like tips; akene lightly hairy.

V. altíssima, Nutt. Tall; leaves lanceolate; cyme loose; scales close, obtuse or simply mucronate; akene slightly hairy. Penn., W. and S.

V. fasciculàta, Michx. Scales of involucre blunt and pointless, except perhaps some of the lowest; akene smooth. Ohio, W. and S.

* * *Leaves scabrous above, often revolute.*

V. angustifòlia, Michx. Slender, 1°–3° high; leaves filiform to linear-lanceolate; akenes minutely hirsute. N. C., S. and W.

2. PIQUÈRIA. (Named for a Spanish botanist, *A. Piquerio.*).

P. trinérvia, Cav. Mexico; cult. for winter-blooming; smooth, 2°–3° high (also a dwarfer form), branched, with lance-oblong, 3-nerved, sparingly serrate leaves, and loose panicled corymbs of very small white-flowered heads; much used in dressing larger cut flowers. A form with white-edged leaves is used for edgings. In gardens often known as STÈVIA SERRÀTA. 2

3. SCLERÓLEPIS. (Greek: *hard scale*, referring to the pappus.) 2

S. verticillàta, Cass. Stem simple, rooting in water at the base; leaves linear and entire, small, in whorls of 4–6; flowers rose-purple or flesh-colored in a small terminal peduncled cluster. Pine barrens, N. J., S.

4. AGÉRATUM. (Greek: *not growing old*, probably applied originally to some sort of Everlasting.)

A. conyzoïdes, Linn. Soft-downy, 2°–3° high; ovate or somewhat heart-shaped petioled leaves; corymbed heads of azure-blue flowers, produced all summer and autumn. Known in gardens as A. MEXICÀNUM. Tropical Amer.; sparingly nat. S. ①

5. MIKÀNIA, CLIMBING HEMPWEED. (A Bohemian botanist, *Prof. Mikan.*)

M. scándens, Willd. Rather handsome plant, climbing over bushes in low grounds, N. Eng. S. and W.; leaves triangular-heart-shaped or halberd-shaped; heads small, of purplish flowers, in summer. 2

6. **EUPATÒRIUM**, THOROUGHWORT, BONESET. (Dedicated to *Eupator Mithridates*, who is said to have used the European species in medicine.) 2ℓ Following are the commonest.

§ 1. *Receptacle flat; scales of the involucre mostly unequal and more or less imbricated.*

* *Leaves 3-6 in a whorl; heads 5–15-flowered, cylindrical, the purplish scales closely imbricated in several rows; flowers flesh-colored.*

E. purpùreum, Linn. PURPLE T. or JOE-PYE WEED. Stems simple, 3°–12° high, with or without purplish spots or dots; leaves on petioles, very veiny, oblong-ovate, roughish-toothed and pointed; corymbs dense, compound. Low grounds.

* * *Leaves alternate or the lower opposite, all long-petioled; corymbs compound; scales imbricated; flowers* 12–15 *in the head, small, white.*

E. serótinum, Michx. Low grounds from Maryland to Minn. and S., minutely pubescent, tall (3°–6° high), bushy-branched; leaves ovate-lanceolate and taper-pointed, triple-ribbed, coarsely-toothed, 5′–6′ long; the involucre very downy.

* * * *Leaves opposite (or only the uppermost alternate) and sessile; heads corymbed; the scales more or less imbricated; flowers white.*

+– *Leaves separate at base; heads mostly* 5–8-*flowered.*

+– +– *Base of leaves broad.*

E. sessilifòlium, Linn. Smooth; 4°–6° high, with lance-ovate serrate leaves (3′–6′ long) tapering from a rounded closely sessile base to a slender point, and small heads (with obtuse scales) in very compound flat corymbs. Mass., S. and W.

E. rotundifòlium, Linn. Leaves roundish-ovate, blunt, deeply toothed; heads in a large and dense corymb, the scales acute. R. I., S.

E. teucrifòlium, Willd. Low grounds near the coast; roughish-pubescent; ovate-oblong or lance-oblong, veiny, deeply few-toothed leaves and small corymbs; scales oblong-lanceolate.

+– +– *Base of leaves narrow.*

E. álbum, Linn. Roughish-hairy, 2° high; leaves oblong-lanceolate, coarsely toothed and strongly veiny; heads crowded in the corymb; the lanceolate and pointed scales of the involucre white above and larger than the flowers. Sandy soil, L. I., S.

E. altíssimum, Linn. Stout and tall, 3°–7° high, downy, with lanceolate leaves (resembling those of some Goldenrods) tapering to both ends and conspicuously 3-nerved, either entire or toothed above the middle; corymbs dense; scales of the involucre blunt. Penn., W. and S.

E. hyssopifòlium, Linn. 1°–2° high; smoothish, with narrow linear or lanceolate blunt, 1–3-nerved leaves. Dry sterile soil, from Mass., S.

+– +– *Leaves united at base around the stem in pairs (connate-perfoliate).*

E. perfoliàtum, Linn. THOROUGHWORT or BONESET. Low grounds everywhere (the bitter infusion used as a popular medicine); 2°–4° high, hairy; the lanceolate leaves taper-pointed, serrate, very veiny, and somewhat wrinkled, 5′–8′ long; the very numerous heads crowded in a dense corymb, 10–30-flowered.

* * * * *Leaves opposite, petioled, triple-ribbed; heads in corymbs, 8–30-flowered, the scales of the involucre equal and almost in one row; flowers white.*

E. ageratoìdes, Linn. WHITE SNAKE ROOT. Smooth, 2°–3° high; broadly ovate, long-petioled, coarsely and sharply toothed, thin leaves

(4′–5′ long); heads of handsome pure white flowers in compound corymbs. Woods, N.

E. aromàticum, Linn. Like the preceding, commoner S., and only near the coast; more slender, usually less smooth, with thicker leaves more bluntly toothed on short petioles; the corymbs usually less compound.

§ 2. *Receptacle hemispherical or conical; scales nearly equal, only slightly imbricated.*

E. cœlestìnum, Linn. 1°–2° high; leaves triangular-ovate or slightly heart-shaped, coarsely toothed; corymb flat; heads small, of blue-purple flowers, in autumn. N. J., W. and S.

7. KÙHNIA. (For *Dr. Adam Kuhn* of Penn.)

K. eupatorioìdes, Linn. A rather homely herb, 2°–3° high, with lanceolate leaves, and panicled or corymbed small heads of creamy flowers. N. J. to Minn. and S. ♃

8. LIÀTRIS, BUTTON SNAKEROOT or BLAZING STAR. (An unexplained name.) Chiefly in sandy soil. Flowers late summer and autumn. Root tuberous or corm-like. ♃

Trílisa, differing in fibrous root, not plumose pappus, little imbricated involucre, and more or less panicled heads, has two species from Va., S.

* *Bristles of the pappus plainly plumose to the naked eye.*

+ *Heads small, only 4–5-flowered.*

L. élegans, Willd. Often hairy or downy, 2° high, with compact spike; short lanceolate or linear leaves; scales of involucre with spreading, rose-purple tips. Va., S.

+ + *Heads large and fewer, cylindrical, many-flowered.*

L. squarròsa, Willd. Common Blazing Star. 1°–5° high; leaves linear; heads few, about 1′ long; scales of involucre with spreading leaf-like tips. Penn., S. and W.

L. cylindràcea, Michx. Smaller than the preceding, 6′–18′ high, the narrow heads with short and rounded appressed tips. W. N. Y., W.

* * *Bristles of the pappus not plainly plumose to the naked eye.*

+ *Heads 30–40-flowered, commonly an inch broad.*

L. scariòsa, Willd. Stem stout, 2°–5° high; leaves lanceolate, or the lower spatulate-oblong; scales of the involucre very numerous, with rounded tips, often scarious or purple on the margins. N. Eng., W. and S.

+ + *Heads 3–15-flowered, from ¼′–½′ long; stem 2°–5° high.*

L. pycnostàchya, Michx. Leaves linear or lance-linear; spike very dense of about 5-flowered heads; scales of the involucre with recurving purplish tips. Prairies, W.

L. spicàta, Willd. The commonest species, in low grounds; heads 8–12-flowered, crowded in a long spike, the oblong and blunt scales of involucre without any obvious tips.

L. graminifòlia, Willd. Heads 7–12-flowered in a looser spike or raceme; the rigid appressed scales blunt or slightly pointed. Wet pine barrens from N. J., S.

L. grácilis, Pursh. Leaves spreading, the lower lance-oblong and long-petioled, the others linear and short; heads 3–7-flowered, small. Ga., S.

9. **GRINDÈLIA.** (*H. Grindel*, a Russian botanist.) (p. 226.)

G. squarròsa, Dunal. Branching leafy herb, a foot or two high, on prairies from Ill., W.; also cult. Leaves spatulate-oblong, or narrower; involucre with strongly spreading or squarrose bracts with short-filiform tips; pappus of 2 or 3 awns. Usually ☌. There is a rayless form.

10. **CHRYSÓPSIS**, GOLDEN ASTER. (Greek: *golden appearance*, from the yellow flowers.) Low herbs, wild chiefly S. and W., in dry and barren or sandy soil; flowers summer and autumn. ☌ (p. 225.)

* *Leaves and akenes linear or nearly so.*

C. graminifòlia, Nutt. Silvery-silky, with long, lance-linear and grass-like, shining, nerved leaves, and single or few heads. Del., S.

C. falcàta, Ell. Only 4′–10′ high, woolly, clothed to the top with short and linear, 3-nerved, rigid leaves, which are often curved or scythe-shaped; heads small, corymbed. On the coast from Cape Cod to N. J.

* * *Leaves oblong or lanceolate; akenes obovate, flattened.*

C. gossýpina, Nutt. White-cottony all over (whence the name), with oblong, obtuse, rarely toothed leaves, and few pretty large heads. Va., S.

C. Mariàna, Nutt. The commonest species, from L. I., S.; silky, with long and weak hairs, or smoothish when old, with oblong leaves, and a few corymbed heads on glandular peduncles.

C. villòsa, Nutt. Coarsely hairy and somewhat hoary, leafy to the top, with corymbed branches bearing single heads on short peduncles, and narrow-oblong leaves. Wis., S. and W.

11. **SOLIDÀGO**, GOLDEN-ROD. (From Latin: *to make whole*, from supposed healing qualities.) ☌ Characteristic plants of the American autumn. The following synopsis includes the most important species. For a fuller account, see the Manual and Chapman's Flora (p. 225).

* *Heads sessile and small, in flat-topped corymbs; leaves linear.*

S. lanceolàta, Linn. Leaves lance-linear, 3–5-nerved; rays 15–20. N. and S.

S. tenuifòlia, Pursh. Leaves linear, 1-nerved, dotted; rays 6–12. N. and S.

* * *Heads all more or less pediceled, usually larger; leaves usually broader.*

+ *Scales of involucre with green herbaceous spreading tips.*

S. squarròsa, Muhl. Leaves large, oblong, or lower ones spatulate-oval; heads numerous, with 12–16 rays. Me., W. and S.

S. petiolàris, Ait. Leaves small, oval or oblong, mucronate; heads few, in a wand-like raceme or panicle; rays about 10. Ill., S. and W.

+ + *Scales not green, nor conspicuously spreading.*

++ *Heads in small clusters in the leaf-axils (or the uppermost sometimes becoming glomerate-spiked).*

= *Akenes pubescent.*

S. cæsia, Linn. Stem cylindrical, glaucous; leaves lanceolate, serrate, sessile; clusters very short, in upper axils, sometimes racemose on the branches. N. and S.

S. latifòlia, Linn. Stem angled and zigzag; leaves broadly ovate, strongly serrate, pointed both ends; rays 3–4. N. and S.

S. Curtísii, Torr. & Gray. Stem angled; leaves oblong or long-lanceolate, with narrow, entire base, toothed above; clusters loose; rays 4–7. Va., S.

= = *Akenes glabrous.*

S. bícolor, Linn. Gray-hairy, strict; leaves oblong or elliptic, somewhat serrate; upper clusters spicate or nearly panicled; involucral scales very obtuse; rays 5–14, cream-color. N. and S.

S. montícola, Torr. & Gray. Nearly glabrous; leaves oblong-ovate or narrower, the lower sparingly serrate; scales acutish; rays yellow, 5–6. Md., S.

++ ++ *Heads in a compound terminal corymb, not at all axillary or racemose.*

= *Leaves folded and recurved.*

S. Riddéllii, Frank. Smooth, 2°–4°, very leafy; leaves long linear-lanceolate, those on the stem mostly clasping; heads 20–30-flowered, very numerous. Grassy lands, Ohio, W. and S.

= = *Leaves flat.*

S. rígida, Linn. Rough, somewhat hoary, 2°–5°, very leafy; leaves oval or oblong, thick; heads large, 30- or more-flowered; rays 7–10. N. Eng., S. and W.

S. Ohioénsis, Riddell. Very smooth, 2°–3°, leafy; stem leaves oblong-lanceolate, the radical ones elongated and with margined petioles; head 16–20-flowered; rays 6–7. W. N. Y., W.

++ ++ ++ *Heads in a terminal panicle, or sometimes in a thyrse, small or middle-sized.*

= *Leaves painly 3-ribbed; heads in 1-sided sprays.*

‖ *Both stem and leaves smooth and glabrous (or stem roughish only above).*

o *Leaves firm, thickish: outer involucral scales short and ovate, the inner oblong-linear, all obtuse.*

S. Missouriénsis, Nutt. Smooth, 1°–3°; leaves linear-lanceolate or the lower broader; clusters of heads racemose in a short and broad, rather open panicle; akenes nearly glabrous. Wis., S. and W.

S. Shórtii, Torr. & Gray. Roughish above; leaves oblong-lanceolate; panicle short and crowded; akenes pubescent. S. O. and S. W.

o o *Leaves thinnish; scales linear, obtuse.*

S. Leavenwórthii, Torr. & Gray. Strict and rigid, 2°–4°, scabrous or puberulent above; leaves mostly linear, sharply and finely serrate; panicle long and open; rays 10–12, small. S. C., S.

S. serótina, Ait. Stout, 2°–7°, smooth and sometimes glaucous; leaves lanceolate and taper-pointed, serrate and ciliate, smooth; rays 7–14, rather long. N. and S.

Var. **gigantèa**, Gray. Leaves pubescent, the lateral ribs more prominent. Same range.

‖ ‖ *Stem and generally the leaves prominently pubescent or scabrous (S. serotina, var. gigantea, above, may be sought here).*

o *Plant green.*

S. Canadénsis, Linn. Rough-hairy, stout, 3°–6°; leaves lanceolate and pointed, serrate or sometimes almost entire, pubescent beneath and

rough above; heads small and rays very short. Common and variable. N. and S.

S. rádula, Nutt. Stem and leaves very rough; leaves oblong or obovate-spatulate. Ill., W. and S.

o o Plant ashy-canescent.

S. nemoràlis, Ait. Pubescence close; stem nearly simple, less than 3°; leaves oblanceolate or spatulate-oblong, the lower obscurely crenate; panicle becoming secund or one-sided; rays 5–9, light-colored. Sterile soil, N. and S.

= = Leaves either not at all 3-ribbed, or very obscurely triplinerved.

‖ Leaves all perfectly entire.

S. sempérvirens, Linn. Smooth and stout, 1°–8°; leaves lanceolate and slightly clasping, very smooth, the lowest ones obscurely 3-nerved; heads rather large and showy, the 7–10 rays golden. Seashore, N. B. to Fla. Flowers early.

S. odòra, Ait. Smooth or nearly so, 2°–3°, the stem slender and sometimes reclined; leaves not 3-nerved, linear-lanceolate, shining and pellucid-dotted; heads very small; rays 3–4, rather large. Canada to Fla.

‖ ‖ Some of the leaves more or less crenulate or serrate (except sometimes the first).

o Panicle thyrsoid, pyramidal or long-virgate.

× Scales thin, acute.

S. stricta, Ait. Very smooth, with small, appressed, entire, lance-oblong, thickish leaves, the upper ones mere bracts; heads in a narrow spicate raceme; rays 5–7. Pine barrens, N. J., S.

S. pubérula, Nutt. Minutely hoary; leaves lanceolate-acute; heads very numerous in short racemes which form a long dense panicle; rays about 10. Me., S.

× × Scales firm, obtuse.

S. uliginòsa, Nutt. Smooth, 2°–3°; leaves lanceolate, tapering into a winged petiole; racemes much crowded into a dense wand-like panicle; rays 5–6, small. Bogs, N.

S. speciòsa, Nutt. Smooth, 3°–6°; leaves rather thick, rough-margined, oval or ovate, or the uppermost oblong-lanceolate; heads in numerous erect racemes, which form a pyramidal panicle; rays about 5, large. Can. to N. C. and W.

o o Panicle short and broad or racemose.

× Leaves linear or lanceolate, sessile (on the stem), obscurely veiny; heads in a short and broad panicle of secund clusters.

S. tortifòlia, Ell. Stem 2°–3°, scabrous-pubescent; leaves linear, generally twisted; rays very short. Va., S.

S. pilòsa, Walt. Stout, 3°–7°, with spreading hairs; leaves oblong-lanceolate or ovate-lanceolate, hairy beneath; rays 7–10, very short. Pine barrens, N. J., S.

× × Leaves broad or ample, veiny; heads racemosely paniculate.

+ Foliage rugose-veiny, pubescent or scabrous above or below.

S. pátula, Muhl. Stem strongly angled, smooth, 2°–4°; leaves ovate, very rough above, smooth and veiny beneath; racemes rather short and numerous. Can. to Ga. and Tex.

S. amplexicaùlis, Torr. & Gray. Slender, 1°–3°, more or less pubescent; leaves ovate, acute, scabrous above and soft-pubescent beneath, clasping; rays about 3 (sometimes 0). Fla., W.

S. rugòsa, Mill. Very leafy, 1°–6°, rough-hairy; leaves ovate-lanceolate or oblong, firm, very rugose, often scabrous above and hirsute on the veins beneath; rays 6–9. Can. to Tex.

S. ulmifòlia, Muhl. Stem smooth; leaves thinner, elliptic to oblong-lanceolate, soft-hairy beneath; rays about 4. Me., W. and S.

+ + Foliage inconspicuously reticulated, not scabrous above, and commonly smooth and glabrous beneath.

— Very leafy to the top.

S. Ellióttii, Torr. & Gray. Smooth, stout, 1°–3°; leaves very numerous, elliptic or oblong-lanceolate, acute, strongly veined, thick, shining above; heads in dense spreading racemes of a crowded, often pyramidal panicle. Mass. to Ga.

— — Leaves becoming few and small towards the top of the stem.

S. neglécta, Torr. & Gray. Smooth, stout, 2°–4°; upper leaves oblong-lanceolate, acute and nearly entire, the lower ovate-lanceolate or oblong and sharply serrate; racemes short and dense, becoming spreading; akenes nearly glabrous. Bogs, Can. to Md., W.

S. Boòttii, Hook. From smooth to pubescent, slender, 2°–5°; leaves ovate- to oblong-lanceolate, pointed, finely serrate; heads loosely racemose; rays 1–5 (or 0); akenes pubescent. Va., S.

S. argùta, Ait. Stem angled, smooth, 2°–4°; leaves large and thin, ovate, strongly sharp-serrate; racemes pubescent, spreading, in an elongated open panicle; rays large, 6–7; akene generally glabrous. N. Eng. to Ohio and Va.

S. júncea, Ait. Smooth; stem rigid and mostly simple, 1°–3°; stem leaves elliptic or lance-oval, sharply serrate, pointed, the radical ones lanceolate or narrow-oblong; racemes dense and naked, becoming elongated and recurved, forming a handsome corymbose panicle; rays small, 8–12. Common, Can. to Tenn.

12. BÉLLIS, DAISY. (Latin: *bellus*, pretty.) Flowers spring and summer (p. 225).

B. integrifòlia, Michx. In open grounds from Ky., S. W.; stems branching, spreading, 4′–10′ long, bearing some lanceolate-oblong or spatulate leaves, and terminal, slender-peduncled heads with pale blue-purple rays. ① ②

B. perénnis, Linn. True or English Daisy. Cult. from W. Eu., mostly in double-flowered varieties, i.e., with many or all the disk flowers changed into rays, or, in the common *quilled* form, all into tubes (pink or white); in the natural state the center is yellow, the rays white and more or less purplish or crimson-tipped underneath; head solitary, on a short scape; leaves spatulate or obovate, all clustered at the root. 2

13. BOLTÒNIA. (Named for *James Bolton*, an English botanist.) Wild plants of low grounds S. and W., resembling Asters except in the akenes and pappus; ray flowers blue-purple or nearly white; disk flowers yellow; in autumn. 2 (p. 226.)

B. diffùsa, L'Her. Heads small, loosely panicled on the slender, open branches, which bear small, awl-shaped leaves, those of the stem lance-linear; pappus of several bristles and 2 short awns. Ill. and S.

B. asteroìdes, L'Her. Heads fewer and larger, in corymbs; leaves lanceolate; pappus of minute bristles and 2 (or 0) awns. Penn., S. and W.

14. CALLÍSTEPHUS, CHINA ASTER. (Greek: *beautiful crown.*)
① (p. 225.)

C. hortènsis, Cass. (or C. Chinénsis). The well-known Garden or China Aster, of the gardens, a native of China and Japan, has numerous varieties of various forms and colors, the finest full-double.

15. SERICOCÁRPUS. (Greek: *silky fruit.*) 2ℓ (p. 225.)

* *Pappus rusty; leaves serrate.*

S. conyzoìdes, Nees. Pubescent; leaves oblong-lanceolate, or the lower spatulate, ciliate. Me., S. and W.

* * *Pappus white; leaves entire.*

S. solidagíneus, Nees. Smooth; leaves linear and rigid, obtuse, the margins rough. N. Eng., S.

16. ÁSTER, ASTER, STARWORT. (*Aster*, a star.) This vast genus is too difficult for beginners, and those who are prepared for its study will use the Manual for the northern species, and Chapman's Southern Flora for the few that are peculiarly southern. Common and characteristic plants of the autumn flora (p. 225).

* *Pappus double, i.e. in two rows.*

A. umbellàtus, Mill. Smooth and stout, leafy to the top; leaves long-lanceolate, taper-pointed; heads very many, in compound flat corymbs; rays rather few, white. Common and variable.

A. infírmus, Michx. Slender, only moderately leafy; leaves obovate or oblong-lanceolate, ciliate; heads few on spreading peduncles, white. Mass., S.

A. linariifòlius, Linn. Leaves linear and rigid, rough-margined; heads with violet (rarely white) rays, solitary on simple branches; plant 1°–2°. Common.

* * *Pappus simple.*

+ *Scales mostly closely imbricated, the tips not conspicuously herbaceous or spreading.*

++ *Leaves lanceolate, or narrower.*

A. nemoràlis, Ait. Minutely pubescent, slender, 1°–2°; leaves small and rather rigid, lanceolate, nearly entire, the margins revolute; involucre obconical, the scales linear-lanceolate or the outer awl-like; rays long, dark lilac. Bogs, N.

A. acuminàtus, Michx. Somewhat hairy, the stem simple (1°) and often zigzag; leaves oblong-lanceolate, long-pointed, toothed, not revolute; scales few and loosish, linear-lanceolate; heads not numerous, the rays white or violet. N. Eng. and S. in the Mts.

A. ptarmicoìdes, Torr. & Gray. Smooth or nearly so, the stems simple (8′–2°) and clustered; leaves linear-lanceolate and rigid, entire, not revolute, rough-margined; heads small, white (rarely yellowish W.) in a flat corymb; scales thickish and obtuse. Rocks, N.

++ ++ *Leaves cordate, stalked and coarsely serrate.*

A. corymbòsus, Ait. Slender and often zigzag, 2°; leaves thin and nearly or quite smooth, taper-pointed, the teeth unequal and spreading, on marginless petioles; rays white, 6–9. Woods, Can. to Ga.

A. macrophýllus, Linn. Larger and stouter, with thickish, rough, closely-serrate and abrupt-pointed leaves; heads larger, white or bluish, the rays 10–15. Like range.

+– +– *Scales variously imbricated, the tips herbaceous (green) and spreading, or the outer ones wholly leaf-like.*

++ *Leaves silvery-silky both sides, and sessile and entire.*

A. seríceus, Vent. Slender, 1°–2°; leaves lanceolate or oblong, spreading; involucre globular with spreading scales; heads mostly solitary, showy, violet. Dry soil, Wis., W. and S.

A. cóncolor, Linn. Leaves crowded and appressed, as are the scales of the obovoid involucre; heads in a compound wand-like raceme, violet. Near the coast, R. I., S.

++ ++ *Leaves not silvery-silky, various.*

= *Stem leaves all (or at least the lowest) cordate and petioled; radical leaves all prominently cordate.*

‖ *Rays about 40; involucral scales squarrose.*

A. anómalus, Engelm. Pubescent and roughish, 2°–4°; upper leaves small and nearly or quite sessile; heads rather large, bright violet. Ill., W. and S.

‖ ‖ *Rays 10–20, light-blue or white; scales not squarrose.*

○ *All or part of the petioles wing-margined.*

A. undulàtus, Linn. Leaves ovate or lance-ovate, the margins wavy or slightly toothed, roughish above and downy beneath, the uppermost with clasping petioles. Common.

A. sagittifòlius, Willd. Rigid and erect, 2°–3°, with ascending branches; leaves ovate-lanceolate, the lower cordate and on margined petioles, the upper becoming narrower; involucre oblong, the scales narrow-tapering and loose. Common, N. and S.

○ ○ *Petioles not wing-margined (except occasionally in the first).*

A. cordifòlius, Linn. Stem much branched, the branches diverging and bearing very numerous panicled heads; lower stem leaves all prominently heart-shaped, the petioles ciliate and only slightly or not at all margined; involucre obconical, with short and nearly obtuse, appressed tips. Common, Can. to Ga., and W. Variable.

A. azùreus, Lindl. Heads larger; leaves ovate-lanceolate or oblong, rough, the petioles usually long and hairy, the uppermost becoming nearly linear and sessile, or on the branches even awl-like; involucre obconical, slightly pubescent. N. Y., S. and W.

= = *Stem leaves clasping or sessile (or if short-stalked, not cordate), various.*

○ *Leaves broadish, prominently cordate-clasping or with a winged-petiole-like base. (Forms of A. Novi-Belgii and A. oblongifolius, below, may be sought here.)*

× *Leaves entire (rarely very obscurely toothed in first two).*

A. lævis, Linn. Smooth and glabrous, often glaucous, 2°–4°; leaves thickish, lanceolate or broader, the upper auriculate, or cordate, clasping; involucre hemispherical, with abrupt green tips; rays blue. Common and handsome.

A. pàtens, Ait. Rough-pubescent, 1°–3°, the branches loose and widely spreading; leaves ovate-oblong or longer, rough above and on the margins; involucre ovoid, scales with pointed spreading tips; rays purple. N. and S.

A. Nòvæ-Ángliæ, Linn. Tall and stout, 3°–8°, hairy, very leafy; leaves lanceolate and acute, pubescent; scales nearly equal and loose, awl-like, glandular-viscid; flowers large, rose or purple. Can. to S. C., and W.; also cult.

× × *Leaves with few or many prominent teeth.*

\+ *Leaf base distinctly clasping.*

A. prenantholdes, Muhl. 1°–3°, hairy above in lines; leaves ovate-lanceolate, rough above and smooth beneath, narrowed into a long entire portion which is suddenly dilated into an auricled base; heads on short divergent peduncles, pale violet or whitish. Along streams, N.

A. puníceus, Linn. Tall and stout, 3°–7°, rough-hairy all over (or in some forms smoothish below); leaves oblong-lanceolate and but little narrowed at the base; heads subsessile, in a panicle or thyrse; flowers large, purple to white. Variable. N.; S. to Ga.

\+ + *Leaf base wing-petiole-like, not auriculate.*

A. pátulus, Lam. Glabrous or nearly so, 1°–4°; leaves ovate or oblong-lanceolate, serrate in middle, narrowed at both ends, the lower ones into a winged petiole; heads loosely panicled, violet or white; scales unequal. N. Eng.

A. Ellióttii, Torr. & Gray. Stem (2°–3°) minutely pubescent; leaves thickish, oblong-lanceolate, appressed-toothed, tapering into a narrow, petiole-like contraction; heads numerous, corymbose-paniculate, purple; scales nearly equal. S. C. to Fla.

o o *Leaves (mostly narrower) not cordate-clasping, nor with wing-sessile bases.*

× *Involucre and branchlets viscid or glandular.*

\+ *Leaves rigid and obtuse.*

A. grandiflòrus, Nutt. Slender, hispid, 1°–3°; leaves very small, linear; rays violet, long. Handsome. Va., S.

\+ + *Leaves soft and acute.*

A. oblongifòlius, Nutt. Minutely glandular-puberulent, 1°–2°; leaves narrow-oblong or lanceolate, mucronate, somewhat clasping; flowers rather small, purple. Banks, N.

A. spectábilis, Ait. Roughish, stout, 1°–2°, leaves oblong-lanceolate or spatulate-oblong, mostly entire; heads few, large and showy (purple), the scales with the upper half herbaceous and spreading. Near the coast, Mass. to Del.

× × *Not viscid or glandular (except, perhaps, in A. surculosus).*

\+ *Radical leaves tapering into margined petioles.*

– *Leaves entire or obscurely serrate.*

A. surculòsus, Michx. Low (1° or less), with filiform rootstocks; leaves linear or lanceolate, rigid; heads medium-sized, few or solitary, light purple. Near coast, N. J., S.

A. grácilis, Nutt. Leaves oblong-lanceolate and small; scales coriaceous and whitish, with short-ovate green tips; heads few. Pine barrens, N. J., S. and W.

– – *Leaves sharply serrate.*

A. rádula, Ait. Smooth or lightly hairy, leafy, 1°–3°; leaves oblong-lanceolate, pointed, rugose, rough both sides, very closely sessile; scales with short, spreading green tips; flowers light-violet. N. Eng. to Del.

\+ + *Radical leaves not with margined petioles.*

– *Involucral scales squarrose or with prominently spreading green tips; leaves small, linear and entire; heads small and racemose.*

A. amethýstinus, Nutt. Tall and erect, 2°–5°, somewhat hirsute, branchy; leaves lax; scales with only the tips spreading; rays light blue. Mass. to Ia.

A. multiflòrus, Ait. Pale- or hoary-pubescent, 1°–2°, bushy-branched; leaves rigid and crowded, with rough margins; rays white (rarely bluish). Common in dry ground.

– – Scales generally appressed.

⌣ Plant very smooth, pale and glaucescent.

A. turbinéllus, Lindl. Slender, 3°, paniculately branching; leaves oblong or narrow-lanceolate, with roughish margins; scales linear, with blunt and short green tips; flowers violet. Ill., S. W.

A. virgàtus, Ell. Strict and simple, with the branches terminated by single heads; leaves lanceolate or linear, the lower ones long; scales acutish; flowers violet. Va., S.

⌣ ⌣ Plant variously scabrous or hirsute, not glaucescent (except forms of the first).

⌣ Leaves firm in texture, often thickish; heads rather large and showy, the scales with loosish green tips.

A. Nòvi-Bélgii, Linn. Short, 6′–2½°, some forms wholly smooth, others with sparse pubescence; leaves from oblong to linear-lanceolate, usually entire, the upper somewhat auriculate-clasping, the salt-marsh forms nearly fleshy; flowers blue or violet. Very common, in many forms, along the Atlantic coast, but reaching Ill. Flowers late.

⌣ ⌣ Leaves of ordinary texture; heads mostly smaller, with less prominently green-tipped scales.

⌒ Heads scattered, borne on the ends of slender bracteate branchlets.

A. dumòsus, Linn. Smooth or nearly so, 1°–3°, loosely branched; leaves linear or somewhat broader towards the top of the plant, crowded and entire, rough-margined; involucre bell-shaped, with abruptly green-tipped scales; rays violet or blue. Common.

⌒ ⌒ Heads in lax or racemose 1-sided sprays.

A. racemòsus, Ell. Scabrous-pubescent on the erect or ascending slender branches; leaves linear and rigid, small, acute, entire; flowers small, purplish, the scales very narrow and acute. S. C., S.

A. vimíneus, Lam. Glabrous or very nearly so, 2°–5°, very bushy; leaves small and stiffish, linear or narrow-lanceolate and rather long, the larger ones sparsely serrate; scales narrow-linear, mostly acute; heads very numerous, white. Very common.

A. diffùsus, Ait. Pubescent, branchy; leaves large, thin and lax, lanceolate or broader, sharply serrate; scales linear, obtuse or acutish; flowers white or violet. Very common and variable.

⌒ ⌒ ⌒ Heads (in mature plants) paniculate or thyrsoid.

○ Scales subulately green-tipped; rays commonly pure white.

A. ericoìdes, Linn. Smooth or sparsely hairy, 1°–3°; heads often tending rather to be racemose than paniculate, and borne on the ends of erect, much-bracted branchlets; leaves linear-lanceolate (or the lowest oblong-spatulate), becoming awl-like and stiffish above. Dry grounds. Variable.

A. polyphýllus, Willd. Tall, 4°–5°, with twiggy branches; leaves 4′ or 5′ long, linear-lanceolate; flowers rather large, early. N., and S. to N. C.

○ ○ Scales not awl-tipped; rays violet to white.

() Scales of several lengths.

A. Tradescánti, Linn. Much branched, 2°–4°, the heads small and numerous; leaves lanceolate to linear, tapering to a slender point, the

lower and larger somewhat serrate; scales linear, green at the tip and down the back; rays small, white or violet. Common.

A. paniculàtus, Lam. Often taller, generally more strict, profusely paniculate-branched; leaves thin, oblong or narrow-linear, the lower sharply serrate, upper entire; heads larger, in loose and leafy panicles; scales narrow-linear with green tips and the outer ones green the whole length; flowers violet or nearly white. Common.

A. salicifòlius, Ait. Leaves shorter and firmer than in the last, often scabrous, mostly entire; scales more imbricated, firmer, linear, with acutish green tips; heads (rarely white) tending to be racemosely clustered. Common.

() () *Scales nearly equal.*

A. júnceus, Ait. Slender and nearly simple, 1°–3°; leaves long-linear (3′–5′), all (or all but the lower most) entire; heads comparatively few, light-purple, the outer scales a little shorter than the inner. Bogs, N.

A. longifòlius, Lam. More branched; leaves broader, entire or sparsely serrulate; heads larger, the scales about equal and little imbricated; rays violet to almost white. Far N.

17. ERÍGERON, FLEABANE. (Greek words for *spring* and *old man*, suggested probably by the hoary appearance of some vernal species.) (p. 225.)

* *Rays conspicuous; heads more or less corymbed; stem erect.*

+ *Rays purple or purplish, very numerous* (50–150); *pappus simple.* 2

E. Philadélphicus, Linn. Rather hairy, 2° high; stem leaves oblong, mostly entire, and partly clasping; spatulate and toothed root leaves, and several heads; rays very many and narrow, pale reddish-purple; flowers summer. Common.

E. bellidifòlius, Muhl. ROBIN'S PLANTAIN. Soft-hairy, 1°–2° high, with a cluster of rather large roundish root leaves lying flat on the ground; stem leaves rather few and small; heads 1–9 and long-peduncled, rather large, with about 50 linear, light bluish-purple rays; flowers late spring. Common.

+ + *Rays white, only about* 30, *rather broad; pappus simple.* 2

E. nudicaùlis, Michx. Smooth, with oval or spatulate leaves all at the root; slender scape 1°–2° high, with a few small heads; flowers spring. Low grounds, Va., S.

+ + + *Rays white or nearly so,* 50 *or more, narrow; pappus double, the outer of a row of minute chaffy bristles or little scales.* ① ②

E. strigòsus, Muhl. 2°–4° high, smoothish, or roughish, with minute close-pressed hairs; leaves entire, the lower spatulate and slender-petioled, the upper lanceolate; rays rather long; flowers all summer. Fields.

E. ánnuus, Pers. 3°–5° high, branched above, roughish, with spreading hairs; leaves ovate or lance-ovate, the lower ones coarsely toothed; rays rather short, often tinged with purple; flowers all summer. Fields and waste places.

* * *Rays inconspicuous, scarcely longer than the cylindrical, bell-shaped, involucre and the simple pappus, numerous, in more than one row.*

E. Canadénsis, Linn. HORSEWEED, BUTTERWEED, MARE'S-TAIL. A common weed, with strong odor, in waste or cult. ground; bristly hairy; stem erect, strict, 1°–5° high; leaves linear, only the lowest ones cut-lobed; heads of whitish flowers very small, panicled; all summer. ①

18. BÁCCHARIS. (Dedicated to *Bacchus.*) Shrubby seaside or pine-barren plants. (p. 224.)

B. halimifòlia, Linn. Smooth, somewhat scurfy, 6°–12°, the branches angled; leaves obovate, petioled, coarsely toothed or the upper ones entire; heads of whitish or yellowish flowers scattered or in leafy panicles. Mass., S.

19. PLÙCHEA. (The *Abbé Pluche*, a naturalist of a century ago.) (p. 223.)

P. bifrons, DC. Leaves oblong to lanceolate, closely sessile or clasping, veiny, 2′–3′ long. 2°–3°. ♃ Cape May, S.

P. camphoràta, DC. Pale; leaves oblong-ovate or lanceolate, thickish and only obscurely veiny, the larger ones short-petioled. Taller. ① Salt marshes, Mass., S.

20. FILÀGO, COTTON ROSE. (Latin: *filum*, a thread, from the cottony hairs.) (p. 223.)

F. Germánica, Linn. Herba Impia of the old herbalists — the branches with a new generation of clustered heads rising out of the parent cluster at the top of the stem (as if undutifully exalting themselves); stems 5′–10′ high, crowded with the lanceolate, erect, and entire cottony leaves. Old dry fields from N. Y., S.; flowers summer and autumn. ①

21. GNAPHÀLIUM, EVERLASTING, CUDWEED. (Greek: *lock of wool.*) (p. 223.)

* *Scales of the involucre white or yellowish-white; stem erect, 1°–2° high; heads many, corymbed. Common in old fields, copses, etc.*

G. polycéphalum, Michx. Leaves lanceolate, with narrowed base and wavy margins, the upper surface nearly naked; the perfect flowers few in the center of each head. ①

G. decúrrens, Ives. Common from N. J. to Mich. and N.; leaves lance-linear, cottony both sides, the base partly clasping and extending down on the stem; many perfect flowers in the center of each head. ♃

* * *Scales of the involucre tawny-purplish or whitish, not at all showy or petal-like; heads small, crowded in sessile clusters; stems spreading or ascending, 3′–20′ high.* ①

G. uliginòsum, Linn. An insignificant little weed in wet places, especially roadsides, with lanceolate or linear leaves, and inconspicuous heads in terminal clusters.

G. purpùreum, Linn. Taller, with oblong-spatulate or lanceolate leaves green above and white-cottony beneath, and purplish heads in axillary clusters, or spiked along the upper part of the stem; pappus plumes united at the base, and all falling off together. Coast of Me., S.

22. ANTENNÀRIA, EVERLASTING. (Name from the pappus of the staminate flowers, which resembles the *antennæ* of certain insects.) ♃ (p. 223.)

A. plantaginifòlia, Hook. Growing in patches, spreading by runners and offsets; the root leaves spatulate or obovate and tufted; flowering stems 4′–8′ high, with few and small lanceolate leaves; heads in a small corymb, the fertile ones (pointed, with pinkish styles) with narrow and acutish, the staminate (flat-topped) with white and rounded scales. Sterile soil; common.

23. **ANÁPHALIS**, EVERLASTING. (Greek, of no application.) 2l (p. 223.)

A. margaritàcea, Benth. & Hook. Stem about 2° high, leafy to the top; the leaves lance-linear; heads in a broad corymb, the fertile ones with a few imperfect staminate flowers in the center; scales of the involucre pearly white, rounded. Dry soil; common.

24. **HELÍPTERUM**, EVERLASTING, IMMORTELLE. (Greek: *sun* and *wing*, referring to the light plumed pappus.) Also known as RHODÁNTHE. (p. 224.)

H. Manglèsii, F. Muell. Cult. in gardens for ornament, from Australia; a low smooth herb, with oblong and alternate clasping entire leaves, and loosely corymbed, showy, nodding heads of yellow flowers, the pearly involucre obovate or obconical, smooth, rose or white, very ornamental, in summer.

25. **HELICHRÝSUM**, EVERLASTING, IMMORTELLE. (Greek, referring to the golden flower heads.) (p. 223.)

H. bracteàtum, Andr. or (H. MACRÁNTHUM). From Australia; tall, smoothish or slightly downy, with lanceolate leaves; large heads terminating the branches and with some leaf-like bracts on the peduncle, the permanent and very numerous scales of the involucre very showy and petal-like, spreading in many ranks, golden yellow, and with white varieties. ② ①

26. **AMMÒBIUM**, EVERLASTING, IMMORTELLE. (Greek: meaning *living in sand.*) ① (p. 224.)

A. alàtum, R. Br. 1°–3° high, rather cottony; root leaves oblong and tapering downwards into a petiole; stem leaves small and lanceolate, and extended down the branches and stems in the form of leaf-like wings; heads solitary, with pearly white involucre surrounding yellow flowers. Cult. from Australia.

27. **ÍNULA**, ELECAMPANE. (Ancient Latin name.) 2l (p. 224.)

I. Helènium, Linn. COMMON ELECAMPANE. A stout herb, with stems 3°–5° high, from a thick mucilaginous root (used in medicine); leaves large, entire, woolly beneath, those from the root ovate and petioled, the others partly clasping; heads large, but the rays very narrow. In old gardens and natural from Eu. by roadsides.

28. **POLÝMNIA**, LEAFCUP. (The muse, *Polyhymnia*, the dedication for no obvious reason.) 2l (p. 226.)

P. Canadénsis, Linn. 3°–5° high, clammy-hairy; leaves thin, the lower pinnatifid, the upper 3–5-lobed or angled; rays of the small heads shorter than the involucre, few, pale-yellow and broad. Moist woods.

P. Uvedàlia, Linn. Roughish-hairy, stout, 4°–10° high; leaves large, ovate and angled or lobed, the upper ones sessile; rays of the large head 10–15, bright yellow, longer than the involucre. Rich soil, N. Y., S. and W.

29. **SÍLPHIUM**, ROSIN PLANT. (Ancient Greek name.) Flowers summer and autumn. 2l (p. 226.)

* *Leaves alternate, large, most of them petioled.*

– *The stout and rough flowering stems (3°–6° high) leafy up to the few large heads; scales of involucre ovate, with tapering and spreading rigid tips.*

S. laciniàtum, Linn. ROSINWEED or COMPASS PLANT, of prairies, from Mich. W. and S., so called because the rough-hairy, deeply

pinnatifid root leaves (of ovate outline) incline to present their edges N. and S.

+ + *The slender smooth flowering stems* (4°–10° *high*) *leafy only near the base, dividing above into a panicle of many smaller heads.*

S. terebinthinàceum, Linn. Prairie Dock, so called from the appearance of the large root leaves, which are ovate or heart-oblong and 1°–2° long, besides the slender petiole, the margins somewhat toothed. Ohio, W.

S. compósitum, Michx. More slender and smaller, with round heart-shaped leaves either toothed or cut, or divided. N. C., S.

* * *Leaves, or many of them, in whorls of* 3 *or* 4 *along the terete stems, rather small, entire or coarsely toothed.*

S. trifoliàtum, Linn. Stem smooth, often glaucous, 4°–6° high; leaves lanceolate and entire or nearly so, roughish; heads small. S. and W.

S. Asteríscus, Linn. Rough-hairy; leaves usually coarsely toothed; heads fewer and larger. Va., S.

* * * *Leaves opposite and clasping or connate; stems leafy to the top.*

S. integrifòlium, Michx. Roughish, 2°–4° high, with terete stem and lance-ovate, partly heart-shaped, and entire, distinct leaves. Mich. W. and S.

S. perfoliàtum, Linn. Cup Plant. Very smooth square stems 4°–9° high, around which the ovate, coarsely toothed leaves are connate into cups which hold water from the rains. Mich., W. and S.

30. PARTHÈNIUM. (Greek: *virgin*, of no application.) 2*l* (p. 227.)

P. integrifòlium, Linn. A coarse, rough plant, 1°–4° high, with alternate, oblong or oval, crenate-toothed leaves (the lower cut-lobed), and small whitish heads in a flat and dense corymb. Dry soil, Md. to Minn. and S.

31. ÌVA, MARSH ELDER. (Name unexplained.) (p. 223.) Our commonest species is

I. frutéscens, Linn. Nearly smooth, shrubby at the base, 3°–8°; leaves oval or lanceolate, coarsely toothed, fleshy; greenish-white heads axillary and forming a leafy panicled raceme. Salt coast marshes, Mass., S.

32. AMBRÒSIA, RAGWEED. (The classical name.) (p. 222.) Flowers greenish, all summer and autumn.

* *Leaves all opposite.*

A. trífida, Linn. Tall, coarse herb along low borders of streams; 4°–10° high, rough; leaves deeply 3-lobed on margined petioles, the lobes lance-ovate and serrate; staminate heads in racemes, their involucres 3-ribbed on one side, the fertile one or fruit obovate and with 5 or 6 ribs ending in a tubercle or spiny point. ①

* * *Some or all the leaves alternate.*

A. bidentàta, Michx. Hairy, 1°–3° high, very leafy; leaves alternate, closely sessile, lanceolate, and with a short lobe or tooth on one side near the base; heads in a dense spike, the top-shaped involucre of the sterile ones with a large lanceolate appendage on one side. Prairies, Ill., S. and W.

A. artemisiæfòlia, Linn. Roman Wormwood, Hogweed, Ragweed, or Bitterweed. Waste places and roadsides; 1°–3° high, hairy or roughish; twice pinnatifid leaves, either opposite or alternate, pale or hoary beneath; staminate heads in panicled racemes or spikes, the small, roundish fruit with about 6 little teeth or spines.

33. XÁNTHIUM, COCKLEBUR, CLOTBUR. (Greek: *yellow*, the plants said to yield that color.) Coarse and vile weeds, with stout and low branching stems, alternate and petioled, merely toothed or lobed leaves, and obscure greenish flowers, produced all summer. ① (p. 222.)

* *Triple spines in the axils of the leaves.*

X. spinòsum, Linn. Stems slender and hoary, 1°–2°; leaves narrowed at both ends, ovate-lanceolate, sometimes lobed or cut; fruit involucre ½′ long, with 1 beak. Waste places, E. Tropics.

* * *No spines in the axils.*

X. strumàrium, Linn. Leaves cordate or ovate, dentate, often lobed; fruit involucre ½′–⅝′ long, glabrous or puberulent, with nearly straight beaks and slender spines. Plant 1°–2°. Waste places. Old World.

X. Canadénse, Mill. Stouter; fruit 1′ long, densely prickly and hispid, the beaks usually hooked or strongly curved. Waste places.

34. ZÍNNIA. (*J. G. Zinn*, a German botanist.) Commonly cultivated for ornament. (p. 227.)

Z. élegans, Jacq. Garden Zinnia. Leaves ovate, heart-shaped, half-clasping; heads very large, rose-colored, purple, violet, red, or white, 2′–3′ in diameter, also full-double like a small Dahlia; chaff of receptacle crested-toothed at tip; akenes barely 2-toothed at summit. Mexico. ① Cult. in many forms and under many names.

Z. pauciflòra, Linn. (or *Z.* multiflòra). Less common in gardens, being less showy; leaves ovate-lanceolate; peduncle hollow, much enlarged under the head; rays obovate, red-purple; chaff blunt, entire; akenes 1-awned. Mexico. ①

Z. angustifòlia, HBK. (Cult. as *Z.* aùrea), from Mexico; is widely and copiously branched, rough-hairy, with lanceolate leaves; many small heads; oval orange-yellow rays, and conspicuously pointed chaff.

35. HELIÓPSIS, OXEYE. (Greek-made name, from the likeness to Sunflower.) ♃ (p. 228.)

H. lævis, Pers. Resembles a Sunflower, but has pistillate rays and 4-sided akenes, sometimes without pappus; 1°–4° high, smooth; leaves ovate or lance-ovate, triple-ribbed, petioled, serrate; head of golden-yellow flowers (with linear rays) terminating the branches, in summer; pappus of 2–4 minute teeth, or 0. N. Y., W. and S.

H. scàbra, Dunal. Roughish, particularly the leaves, which are more narrowly pointed, and the upper ones sometimes entire; rays broader; pappus of 2 or 3 conspicuous teeth. N. Y., W. and S.

36. ECHINÀCEA, PURPLE CONE-FLOWER. (Greek; *hedgehog*, viz., receptacle with prickly pointed chaff.) ♃ (p. 228.)

E. purpùrea, Moench. Stems (usually smooth) 1°–2° high, from a thick and black, pungent-tasted root (called *Black Samson* by quack-doctors), bearing ovate or lanceolate, 5-nerved and veiny leaves, the lower long-petioled, and terminated by a large head; rays 15–20, dull rose-purple. Penn., W and S.

E. angustifòlia, DC. From Wis. S., is a more slender form, bristly-hairy, with narrow, lanceolate, 3-nerved, entire leaves, and 12–15 brighter-colored rays.

37. RUDBÉCKIA, CONE-FLOWER. (Named for *Rudbeck*, father and son, Swedish botanists.) (p. 228.)

* *Disk oblong, or in fruit cylindrical and 1′ long, greenish yellow, the chaff very blunt and downy at the end; leaves all compound or cleft.* ♃

R. laciniàta, Linn. 3°–7° high, smooth, branching above; lowest leaves pinnate with 5–7 cut or cleft leaflets, upper ones 3–5-parted, or the uppermost undivided; heads long-peduncled, with linear drooping rays 1′–2′ long. Thickets; common.

* * *Disk conical, dark-purple, the chaff awn-pointed; lower leaves often pinnately parted or 3-cleft.* ②

R. tríloba, Linn. Hairy, 2°–5° high, much branched; upper leaves lance-ovate and toothed, and the numerous small heads with only about 8 rays. Penn. to Mo. and S.

* * * *Disk globular, pale dull brownish (receptacle sweet-scented), the chaff blunt and downy at the end; lower leaves 3-parted.* ♃

R. subtomentòsa, Pursh. Somewhat downy, with leafy stems 3°–5° high, ovate or lance-ovate, serrate upper leaves and short-peduncled heads. Prairies, Wis., W.

* * * * *Disk broadly conical, dark-colored, the soft chaff not pointed; rough-hairy plants 1°–2° high, leafy below, the naked summit of the stems or branches bearing single showy heads; leaves simple.* ♃

R. speciòsa, Wend. Leaves lanceolate or ovate-lanceolate, pointed at both ends, 3–5-nerved, petioled, coarsely toothed or cut. Penn., W. and S.

R. hírta, Linn. Stems stout and mostly simple; leaves nearly entire, triple-ribbed, oblong-lanceolate or the lowest spatulate, the upper sessile. N. Y., W. and S.; introduced into meadows E.

38. LÉPACHYS. (Greek: *thick* and *scale*.) Receptacle anise-scented when crushed. ♃ (p. 227.)

L. pinnàta, Torr. & Gray. Minutely roughish and slightly hoary; the slender leafy stems 3°–5° high, bearing leaves of 3–7 lanceolate leaflets, and somewhat corymbed heads with the oval or oblong disk much shorter than the oblong, drooping yellow rays; akenes scarcely 2-toothed, flattish, the inner edge hardly wing-margined. Dry soil, W. N. Y., W. and S.

L. columnàris, Torr. & Gray. 1°–2° high, with single or few long-peduncled heads, their cylindrical disk often becoming 2′ long, and longer than the 5–8 broad drooping rays, these either yellow, or var. **pulchérrima**, with the base or lower half brown-purple; akenes 1–2-toothed at top and winged down one edge. Prairies, W.; also cult.

39. HELIÁNTHUS, SUNFLOWER (which the name means in Greek). The following are the commonest of the numerous species, many of which are difficult of study. (Lessons, Fig. 381.) (p. 227.)

* ① *Receptacle flat and very broad; disk brownish; leaves generally alternate, broad and triple-ribbed, petioled; flowers summer. Cult. for ornament; wild only far W. and S. W.; flowers all summer.*

H. ánnuus, Linn. Common Sunflower of the gardens, with huge heads; leaves green, roughish, not hoary.

H. argophýllus, Torr. & Gray. Texas, cult. for its hoary-white foliage; heads smaller.

* * *Receptacle and disk convex; heads middle-sized or rather small, the disk various; leaves opposite or alternate; flowering throughout late summer and autumn.*

← *Disk dark-purple or brown, contrasting with the yellow rays.*

↔ *Leaves long and linear, 1-nerved, entire, sessile; heads small and mostly corymbed; involucre of leaf-like spreading scales.*

H. angustifòlius, Linn. Slender rough stems 2°–6° high; lower leaves opposite and rough, revolute. Pine barrens, N. J., S.

H. orgyàlis, DC. Stems (6°–10° high); leaves crowded, very narrow, alternate, smooth; flowers late. W. of the Miss. Cult. for its tall strict habit.

↔ ↔ *Leaves oval or lanceolate, opposite; stems 1°–3° high, bearing solitary or few long-peduncled, rather large heads; involucre of short, close scales.*

H. heterophýllus, Nutt. Rather hairy, with lowest leaves oval or oblong, upper ones lance-linear and few; scales of involucre lanceolate. Low pine barrens, Ga., S.

H. rígidus, Desf. Dry prairies W. and S.; rough, with thick firm leaves lance-oblong or the lower oval; scales of the involucre ovate or oblong, blunt.

← ← *Disk yellow as well as the rays, or hardly dingy-brownish.*

↔ *Scales of the involucre short and broadly lanceolate, regularly imbricated, without leaf-like tips; leaves nearly all opposite and nearly entire.*

H. occidentàlis, Riddell. Somewhat hairy, with slender simple stems 1°–3° high, sending off runners from base, naked above, bearing 1–5 heads; lowest leaves ovate or lance-ovate; upper ones narrow, small and distant. Ohio, W. and S.

H. móllis, Lam. Soft white-woolly all over, 2°–4° high, leafy to the top, the leaves heart-ovate and partly clasping. Ohio, W. and S.

↔ ↔ *Scales of the involucre looser and leafy-tipped; stems leafy to the top.*

= *Leaves chiefly alternate and not triple-ribbed.*

H. grósse-serràtus, Martens. Smooth and glaucous, 6°–10°; leaves long-lanceolate, petioled, serrate. Ohio, W. and S.

H. gigantèus, Linn. Rough and rather hairy, 3°–10° high, with lanceolate serrate, nearly sessile leaves, and pale-yellow rays. Common in low grounds.

= = *Leaves mainly opposite, except in the last, 3-ribbed at base or triple-ribbed. (Several species, the following the most important.)*

‖ *Sessile or short-petiolate, entire, or serrulate.*

H. divaricàtus, Linn. Common in dry sterile soil; stem smooth, 1°–3° high; leaves rough ovate-lanceolate, tapering to a point, and 3-nerved at the rounded sessile base.

H. hirsùtus, Raf. Differs from the preceding in its rough-hairy stem 1°–2° high, and leaves with narrower base more or less petioled. Ohio, W.

H. strumòsus, Linn. Stems mostly smooth, 3°–4° high; leaves broadly lanceolate or lance-ovate, rough above and whitish or white-downy beneath, their margins beset with fine appressed teeth, and petioles short and margined. Common.

‖ ‖ *Leaves longer-petioled, coarsely serrate.*

H. decapétalus, Linn. So named because (like the preceding) it commonly has 10 rays; stems branching, 3°–6° high; leaves thin and bright-green, smoothish, ovate, coarsely toothed and abruptly contracted into margined petioles; scales of the involucre long and loose.

H. MULTIFLÒRUS, Linn, of gardens, unknown wild, is probably a modified form of the last. The heads are 2′–4′ across and double; i.e. all the disk flowers ligulate.

H. tuberòsus, Linn. JERUSALEM ARTICHOKE (i.e. *Girasole* or Sunflower in Italian, corrupted in England into *Jerusalem*); cult. for the tubers, and run wild in fence rows; also native, Penn. W. and S.; 5°–7° high, with triple-ribbed ovate petioled leaves, rough-hairy as well as the stems, all the upper ones alternate, the running rootstocks ending in ovate or oblong edible tubers. (Lessons, Fig. 101.)

40. VERBESÌNA, CROWN-BEARD. (Name obscure.) Ours are tall (4°–7° high) branching herbs, in rich soil, with compound corymbs of small heads. 2/ (p. 227.)

V. occidentàlis, Walt. Stems 4-winged; leaves smoothish, large and thin, ovate and opposite pointed, at both ends; flowers yellow; akenes wingless. Penn. to Ill. and S.

V. Virgínica, Linn. Of like range, has stem less winged, smaller lance-ovate alternate leaves soft-downy beneath, white flowers, and narrowly winged akenes.

41. ACTINÓMERIS. (Greek: alluding to the irregularity of the rays in the commonest species.) 2/ (p. 227.)

A. squarròsa, Nutt. Stems branching, 4°–8° high; leaves lance-oblong, tapering to both ends; heads numerous, corymbed; spreading involucre; 4–10 irregular rays, and broadly winged akenes; flowers Sept. N. Y., W. and S.

42. DÁHLIA. (Named for a Swedish professor, *Dahl*, contemporary with Linnæus.) 2/ (p. 227.)

D. variábilis, Desf. COMMON DAHLIA. Leaves pinnate, with ovate serrate leaflets; heads large, much increased in size and altered, of all colors; the ray flowers pistillate; roots fascicled and tuberous (Lessons, Fig. 87). Mexico.

D. coccínea, Cav. Ray flowers scarlet and neutral; the disk flowers yellow; outer involucral bracts 5, reflexed. Mexico.

43. COREÓPSIS, TICKSEED. (From Greek for *bug*, from the shape of the akenes.) Many wild species; several cult. for ornament, being known as CALLIOPSIS. (See Lessons, Figs. 268, 269, 290, 291.) (p. 227.)

§ 1. *Rays broad, coarsely 3–5-toothed; outer involucre not longer than the inner; akenes orbicular or oval, incurved when mature. Chiefly cultivated.*

* ① ② *Disk flowers and lower part of the rays dark-colored or brown-purple; akenes in these species wingless and nearly naked at top; leaves compound.*

C. tinctòria, Nutt. The commonest species of country gardens; smooth, with lower leaves twice-pinnately divided into narrow leaflets, numerous heads, and lower half or sometimes almost the whole of rays brown-purple; in one variety they are changed to tubes. Minn., S.

C. Drummóndii, Torr. & Gray. Low and spreading, rather hairy, with leaves of 3–7 oval leaflets, or some of them simple; heads on long peduncles; very broad rays golden-yellow, with small dark spot at base. Tex. Common in gardens.

* * ① *Disk flowers yellow; rays yellow, with a darker and purplish-streaked spot near the base; akenes winged and 2-toothed.*

C. coronàta, Hook. Low, with slender-petioled leaves — oblong or spatulate, or some of them 3–5-parted — and very long peduncle; rays broad and handsome. Tex. Cult.

* * * ♃ *Disk flowers and rays* (1′ *long*) *entirely yellow; akenes orbicular, much incurved and broadly winged when ripe, crowned with 2 little teeth or scales.*

C. lanceolàta, Linn. Wild W. and S., and cult.; 1°–2° high, smooth or sometimes downy, in tufts, with lanceolate or oblanceolate entire leaves, mostly crowded at the base, and long slender peduncles; flowers in early summer.

C. auriculàta, Linn. Wild W. and S., and in some gardens; taller, sometimes with runners or suckers at base, leafy to near the top; upper leaves oblong, lower roundish and sometimes auricled at base or with 3–5 lobes or leaflets.

§ 2. *Rays entire or nearly so, oblong or lanceolate; akenes oblong, with a very narrow wing or border, not incurved, and obscurely if at all 2-toothed at the apex; scales of outer involucre narrow and entire; heads rather small, the flowers all yellow.* ♃

* *Low, 1°–3° high, leafy to the top; leaves really opposite and sessile, but divided into 3 leaflets, thus seeming to be 6 in a whorl. Wild chiefly in S. States; all but the first are cult. in gardens.*

C. senifòlia, Michx. Seemingly 6 lance-ovate and entire leaflets in a whorl (i.e. two, but each 3-divided), smooth or downy.

C. verticillàta, Linn. The pair of leaves cut into once or twice pinnate almost thread-shaped divisions, smooth.

C. delphinifòlia, Lam. Very like the last, but with fewer lance-linear divisions.

* * *Tall, leafy to the top, with evidently opposite petioled leaves.*

C. trípteris, Linn. Stems simple, 4°–9° high; leaves of 3–5 lanceolate entire leaflets; heads corymbed; very short outer involucre, and blunt rays. Rich ground, W. and S.

§ 3. *Rays oval or oblong, golden yellow, slightly notched; akenes wingless, not incurved, bearing 2 awns or teeth for a pappus; outer involucre conspicuous and resembling leaves; branching plants of wet grounds, with thin leaves mostly of 3–7 pinnate toothed or cut veiny leaflets; resembling the next genus, but the awns not downwardly barbed.* ① ②

C. trichospérma, Michx. Swamps mostly near the coast; 1°–2° high, with 3–7 lanceolate or linear cut-toothed leaflets or divisions; numerous heads, and narrow-oblong or linear wedge-shaped marginless akenes with 2 stout teeth.

C. aùrea, Ait. Upper leaves often simple, lower nearly as in the foregoing, and shorter wedge-obovate akenes with 2 or 4 short, chaff-like teeth. Va., S.

C. aristòsa, Michx. Leaves more compound, with oblong or lanceolate, often pinnatifid leaflets, and broad-obovate, very flat akenes slightly margined and bristly ciliate, the pappus of 2 long and slender awns, or sometimes 3 or 4, or in one variety none at all. Mich., W. and S.

44. BÌDENS, BUR MARIGOLD, BEGGAR'S TICKS, PITCHFORKS. (Latin: *two-toothed*, from the usually 2 awns of the pappus.) Our species ① or ②. The akenes adhere to the dress or to the fleece of animals by their barbed awns. (p. 227.)

* *Akenes broad and flat, with bristly ciliate margins.*

+– *Coarse and very homely weeds, commonly without any rays.*

B. frondòsa, Linn. COMMON BEGGAR'S TICKS. Coarse weed in low or manured grounds; 2°–6° high, branched, with pinnate leaves of 3–5 broad lanceolate, coarsely toothed leaflets, outer involucre much longer than the head, and wedge-obovate akenes ciliate with upturned bristles, and 2-awned.

B. connàta, Muhl. Smooth, 1°–2° high, with simple lanceolate and taper-pointed leaves, or the lower 3-divided and decurrent on the petiole; smaller heads; narrow wedge-shaped akenes, minutely and downwardly ciliate and bearing about 3 awns. Low grounds.

+– +– *Low smooth herbs, with showy golden rays 1′ long.*

B. chrysanthemoìdes, Michx. Shallow water or wet places; 6′–30′ high, with simple, lanceolate, sessile, serrate leaves, outer involucre shorter than the rays, and wedge-shaped akenes with almost prickly, downwardly barbed margins and 2–4 awns.

* * *Akenes linear or needle-shaped.*

B. Béckii, Torr. Immersed in water, N. and W., the single, short-peduncled heads rising above the surface, and with showy rays; leaves cut into very numerous, fine, hair-like divisions; awns of the stout akenes 4–6, barbed near the tip.

B. bipinnàta, Linn. 1°–3° high, branched, with 1–3-pinnately parted, petioled leaves; ovate-lanceolate leaflets; small heads; short, pale-yellow rays, and slender akenes with 3–4 barbed awns. Dry soil, R. I., S. and W.

45. CÓSMOS. (Greek: *an ornament.*) Tall plants with handsome, fine, foliage and very late flowers. Cult. (p. 227.)

C. bipinnàtus, Cav. Leaves pinnately divided into narrowly linear or almost filiform lobes; outer involucral scales ovate-lanceolate and acuminate; rays 1′–2′ long, rose-color. ① Mexico.

C. tenuifòlius, Lindl. Rather lower, the foliage still more finely cut; outer scales less acuminate; rays rich or dark purple. ① Mexico.

46. HELÈNIUM, SNEEZEWEED. (Old Greek name.) (p. 226.)

H. autumnàle, Linn. The commonest species, wild in low grounds; 1°–4° high, with lanceolate, toothed leaves, their base often decurrent on the stem, and a corymb of showy yellow-flowered heads, the rays often drooping, in autumn. 2

47. GAILLÁRDIA. (*Gaillard de Merentonneau*, a French botanist.) (p. 226.)

G. lanceolàta, Michx. Leaves narrow (mostly entire), lanceolate; rays commonly small and few, yellow, and purple disk flowers. S. Car., W. and S. ② 2

G. pulchélla, Foug. Wild from La., W., and cult. for ornament (one form called G. PÍCTA), has broader leaves, some of them cut-toothed or lobed, and showy heads with the large rays mostly brownish crimson-purple with yellow tips. ①

G. arist̀ata, Pursh. More downy than the last, less branched, with large showy rays yellow throughout, or their base brown-purple. In cultivation known as G. GRANDIFLÒRA. 2l Dak., S. and W.

48. DYSÒDIA, FETID MARIGOLD. (Greek: denoting *ill-scent* of the plant.) (p. 224.)

D. chrysanthemoìdes, Lag. A low weed, nearly smooth, with spreading branches, opposite pinnately parted and finely cut leaves, and few yellow rays scarcely exceeding the involucre. Roadsides, W. and S. ①

49. TAGÈTES, FRENCH or AFRICAN MARIGOLD, but from South America and Mexico. (Mythological name.) Plants strong-scented; leaves pinnate, the leaflets cut-toothed. ① (p. 224.)

T. erécta, Linn. LARGE AFRICAN M. Leaflets lanceolate, inflated club-shaped peduncles, and heads of orange or lemon-colored flowers, often full-double.

T. pátula, Linn. FRENCH M. With finer lance-linear leaflets, cylindrical peduncles, and narrower heads, the rays orange or with darker stripes.

T. signàta, Bartl. More delicate, low, much-branched species, with finely cut leaves, slender peduncles, and smaller heads, the 5 rays purple-spotted or spotted and striped with darker orange at base.

50. ÁNTHEMIS, CHAMOMILE. (Ancient Greek name, from the profusion of flowers.) Natives of Old World. Peduncles bearing solitary or very few heads. (p. 226.)

* *Rays neutral.*

A. Cótula, MAYWEED. Roadsides, especially E.; low, strong-scented and acrid, with leaves thrice pinnately divided into slender leaflets or lobes, rather small heads terminating the branches, with white rays and yellow center; all summer. ① (Lessons, Fig. 379.)

* * *Rays pistillate.*

A. arvénsis, Linn. Resembles Mayweed and grows in similar places, but less common; not unpleasantly scented, has fertile rays and a minute border of pappus. ① ②

A. nóbilis, Linn. Yields the Chamomile-flowers of the apothecaries; spreads over the ground, very finely divided foliage pleasantly strong-scented; rays white; pappus none. 2l

A. tinctòria, Linn. Cult. for ornament; 2°–3° high, with pinnately divided and again pinnatifid or cut-toothed leaves and heads as large as those of Oxeye Daisy, with golden-yellow flowers, or the rays sometimes white. 2l

51. ACHILLÈA, YARROW, SNEEZEWORT. (Named after *Achilles.*) Leafy-stemmed, with small heads in corymbs. 2l (p. 226.)

A. Millefòlium, Linn. COMMON Y. or MILFOIL, abounds over fields and hills; 10′–20′ high, with leaves twice pinnately parted into very slender and crowded linear 3–5-cleft divisions, heads crowded in a close flat corymb, with 4 or 5 short rays, white (sometimes rose-colored).

A. Ptármica, Linn. SNEEZEWORT. Run wild from Eu. in a few places, cult. in gardens, especially a full-double variety; leaves simple, lance-linear, sharply cut-serrate; heads in a loose corymb, with 8–12 or more rather long bright white rays.

52. **CHRYSÁNTHEMUM**, including LEUCÁNTHEMUM and PYRÈTHRUM. (*Golden flower* in Greek; but they are of various colors.) All natives of Old World. (p. 226.)

* *Akenes of disk and ray flowers similar, angled or striate, but not winged.* — PYRETHRUMS. ♃

+– *Leaves pinnatisect or compound.*

C. coccíneum, Willd. (PYRÈTHRUM RÒSEUM of gardens). A handsome plant from Persia, cult. in many varieties, the terminal solitary large flowers in various colors, but chiefly in shades of red, and often double (i.e., disk flowers radiate); leaves finely pinnatisect, the lobes linear. Plant 1°–3°, smooth, the lower leaves petioled, the upper sessile. This (with C. CINERARIÆFÒLIUM, Vis., which has stem and lower surface of broader-lobed leaves canescent) is a source of commercial *Pyrethrum* or *Persian insect powder.*

C. Parthènium, Bernh. FEVERFEW. Smooth, with branching, leafy, striate or grooved stems 1°–3°; leaves ovate or oblong-ovate in outline, twice pinnately divided into coarse ovate cut divisions; flowers ¾′ across, whitish, in corymbs, the peduncles leafy or bracted, the rays twice larger than the involucre; short pappus dentate. Common in old gardens, and escaped. Eu.

C. præáltum, Vent. (PYRÈTHRUM PARTHENIFÒLIUM of gardens). GOLDEN FEATHER. Pubescent, or becoming nearly smooth, the stems terete; leaves very much cut, the segments oblong; peduncles naked; rays thrice longer than the involucre; short pappus entire. A yellow-leaved form is used for carpet-bedding. Asia.

+– +– *Leaves toothed or sometimes jagged, but not pinnatisect.*

C. Leucánthemum, Linn. OXEYE DAISY, WHITEWEED. Stem nearly simple and erect, smooth, 1°–2°; leaves oblong-spatulate, sharply pinnatifid-toothed, those on the stem sessile and passing into bracts or wanting near the top; heads large and white, solitary and terminal. An abundant weed E. Eu.

C. uliginòsum, Pers. Tall and strong, 2°–4°, very finely pubescent; leaves lanceolate, tapering at both ends, sessile, very sharply toothed; large (2′–3′ across) white flowers in a terminal corymb. Cult. E. Eu.

C. Balsámita, Linn., var. ***tanacetoides,*** Boiss. COSTMARY, MINT GERANIUM, LAVENDER (erroneously). Tall grayish-canescent (at least above) plant with sweet-scented herbage; leaves oblong, obtuse, long-petioled, obtusely serrate; heads small and yellowish in the common rayless form (rays white when they appear, when the plant is known as C. BALSÁMITA), in a terminal cluster. Asia.

* * *Akenes of disk and ray flowers unlike, those of the rays winged.*

+– *Leaves twice-pinnatifid or pinnatisect.*

C. frutéscens, Linn. MARGUERITE, PARIS DAISY. Bushy and erect, woody at the base, generally smooth, slightly glaucous; leaf segments linear, or the uppermost leaves reduced to trifid bracts; flowers white (rarely yellowish), large (2′–3′ across), with spreading daisy-like rays, all on long naked peduncles. Common in conservatories. Canaries. ♃

C. coronàrium, Linn. SUMMER CHRYSANTHEMUM, with yellow or sometimes whitish flowers, cult. from Mediterranean region; smooth, with diffuse stems; leaves with auricled and clasping base, and lanceolate or linear cut-toothed divisions; the involucre of broad and scarious scales. ①

+– +– *Leaves lobed, but not pinnatifid.* — GARDEN CHRYSANTHEMUMS. ♃

C. Sinénse, Sabine. Canescent above, 2°–4°; the leaves ovate and long petioled, sinuate-cut and lobed, firm in texture, somewhat glaucous;

heads very large, immensely varied under cultivation; the scales of the involucre with narrow scarious margins, and the tubular disk flowers subtended by chaffy scales. Japan; parent of the greater number of garden forms.

C. Indicum, Linn. Leaves more sharply cut, thinner and green; involucral scales with wide scarious margins; no chaff with the tubular disk flowers; heads smaller, yellow rays predominating. Japan.

53. TANACÈTUM, TANSY. (Old name.) 2l (p. 222.)

T. vulgàre, Linn. COMMON TANSY. Eu.; cult. in old gardens, and a roadside weed, 2°–4° high, smooth, strong-scented, and acrid, with deep green 1–3-pinnately compound leaves; the leaflets and winged margins of the petiole cut-toothed; var. CRÍSPUM, leaves more cut and crisped.

54. ARTEMÍSIA, WORMWOOD. (Dedicated to *Ártemis*, the Greek Diana.) (p. 222.)

* *Leaves (and whole plant) smooth and green, or nearly so.*

+ *Very fine thread-like or capillary divisions to the 1–3-pinnately divided leaves; heads loosely panicled.*

A. Abrótanum, Linn. SOUTHERNWOOD. From S. Eu.; cult. in gardens for the pleasant-scented foliage, 3°–5° high, woody-stemmed, strict. 2l

A. caudàta, Michx. Heads small, racemed in a wand-like panicle. Sandy coast and lake shores. ②

+ + *Leaves not very fine or finely cut.*

A. biénnis, Willd. Gravelly banks and shores W., becoming a weed E.; 1°–3° high, with small greenish heads, much crowded in the axils; the once or twice pinnatifid leaves with their lobes linear, in the lower cut-toothed. ① ②

* * *Leaves hoary or cottony, at least underneath.* 2l

A. Absínthium, Linn. WORMWOOD. Old gardens and a roadside weed; strong-scented, silky-hoary, with stems 2°–4° high and rather woody at base, twice or thrice pinnately parted leaves with lanceolate lobes, and nodding hemispherical heads. Eu.

A. vulgàris, Linn. MUGWORT. Old gardens and roadsides, from Eu.; leaves pinnatifid, green above and cottony-white beneath, their lance-linear divisions mostly cut and cleft; heads small, in open panicles.

A. Ludoviciàna, Nutt. Leaves lanceolate, mostly cottony-white on both sides, many of them entire or merely toothed; heads larger in narrow or spike-like panicles. Mich., W. and S. W.

55. TUSSILÀGO, COLTSFOOT. (Latin: *tussis*, a cough, for which the plant is a reputed remedy.) 2l (p. 225.)

T. Fárfara, Linn. Spreading by its creeping (mucilaginous and bitter) rootstocks, which send up, in earliest spring, scaly-bracted scapes, 3′–6′ high, bearing a single Dandelion-like head, followed by the rounded and somewhat angled or toothed heart-shaped or kidney-shaped leaves, which are cottony beneath when young. A weed from Eu., common E.

56. ÁRNICA. (Old name, thought to be a corruption of *Ptarmica*.) The common European species is used in medicine. 2l (p. 225.)

A. nudicaùlis, Nutt. Stem naked, bearing only 1 or 2 pairs of small leaves, although 1°–3° high, the main leaves being clustered at the root, thickish, sessile, ovate or oblong, 3–5-nerved, mostly entire, hairy; heads several, loosely corymbed, pretty large and showy, in spring. Low pine barrens, S. Penn., S.

57. SENÈCIO, GROUNDSEL. (Latin: *senex*, an old man, referring to the hoary hairs of many species, or to the white hairs of the pappus.) (p. 225.)

* *No ray flowers; plant not climbing.*

S. vulgàris, Linn. COMMON GROUNDSEL. A low weed in waste or cultivated grounds E.; corymbose, nearly smooth, with pinnatifid and toothed leaves; flowers yellow. Eu. ①

* * *Heads with no rays and only 6–12 disk flowers, small, yellow; stem extensively climbing, more or less twining.*

S. scándens, DC. Cult. as house plant under the name of GERMAN IVY, but it is from Cape of Good Hope, and resembles Ivy only in the leaves, which are round heart-shaped or angled and with 3–7 pointed lobes, soft and tender in texture, and very smooth; the flowers seldom produced. ♃

* * * *With ray flowers, native herbs; flowers spring and early summer.*

S. lobàtus, Pers. BUTTERWEED. Very smooth, 1°–3° high, with tender lyrate-pinnatifid or pinnate and variously lobed leaves; small heads in naked corymbs, and about 12 conspicuous rays. N. Car., W. and S.

S. aùreus, Linn. GOLDEN RAGWORT, SQUAWWEED. Cottony when young, becoming smooth with age, sometimes quite smooth when young, with simple stems 1°–3° high; root leaves simple and in different varieties either round, obovate, heart-shaped, oblong, or spatulate, crenate or cut-toothed on slender petioles, lower stem leaves lyrate, upper ones sessile or clasping and cut-pinnatifid; corymb umbel-like; rays 8–12. Common in low grounds, and very variable. ♃

* * * * *Heads with rays and numerous disk flowers; cult. for ornament.*

+ *Flowers all yellow.* ♃

S. Cinerària, DC. (or CINERÀRIA MARÍTIMA), of Mediterranean coast, an old-fashioned house plant, ash-white all over (whence the name *Cineraria* and the popular one of DUSTY MILLER), with a woolly coating; the branching stems somewhat woody at base; leaves pinnately parted and the divisions mostly sinuate-lobed; the small heads in a dense corymb.

S. Kæmpferi, DC. (or FARFÙGIUM GRÁNDE). Cult. in greenhouses, where it hardly ever flowers; it is grown for the foliage, the thick and smooth rounded and angled rather kidney-shaped root leaves blotched with white; some of the flowers more or less 2-lipped. China and Japan.

+ + *Ray flowers purple, violet, blue, or varying to white, those of the disk of similar colors or sometimes yellow.*

S. cruéntus, DC. COMMON CINERARIA of the greenhouses, from Teneriffe; herbaceous, smoothish, with the heart-shaped and angled more or less cut-toothed leaves green above and usually crimson or purple on the veins underneath, the lower with wing-margined petioles dilated into clasping auricles at the base; heads numerous in a flat corymb, the handsome flowers purple, crimson, blue, white, or party-colored. ♃

S. élegans, Linn. PURPLE RAGWORT. Smooth herb, with deeply pinnatifid leaves, the lower petioled, the upper with half-clasping base; the lobes oblong and often sinuate-toothed; heads corymbed, with yellow or purple disk flowers and purple or rarely white rays. ① And a full-double variety, having the disk flowers turned into rays. ♃ Cape of Good Hope.

58. OTHONNÓPSIS. (Like *Othonna,* an allied genus.) 2ℓ (p. 225.)

O. cheirifòlia, Jaub. & Spach. Succulent prostrate herb, known in this country by the form grown in window baskets as Othónna crassifòlia. Leaves alternate and cylindrical; small terminal heads of yellow flowers on long and slender pedicels. A pretty hanging-plant. N. Africa.

59. EMÍLIA, TASSEL FLOWER. (Name unexplained.)

Cultivated under the name of Cacàlia. (p. 224.)

E. sonchifòlia, DC. Cult. as a summer annual, from the Old World tropics; very smooth or a little bristly, pale or glaucous, 1°–2° high, with root leaves obovate and petioled; stem-leaves sagittate and partly clasping, and rather showy orange-red heads in a naked corymb, in summer.

60. CACÀLIA, INDIAN PLANTAIN. (Ancient name.) Natives of rich soil. 2ℓ (p. 224.)

* *Receptacle flat; involucre with some bracts at the base.*

C. suavèolens, Linn. 3°–5° high, with halberd-shaped serrate leaves on winged petioles, and rather large heads of 10–30 flowers. Conn. to Ia., and S.

* * *Receptacle pointed in the middle; involucre 5-flowered, of 5 scales, naked.*

C. renifórmis, Muhl. N. J. to Ill. and S. along the mountains; 4°–9° high, with large and green repand-toothed petioled leaves, the lower kidney-shaped, the upper fan-shaped.

C. atriplicifòlia, Linn. Pale or glaucous, with coarsely toothed or angled leaves, the lower almost kidney-shaped, the upper wedge-shaped. N. Y., W. and S.

C. tuberòsa, Nutt. Wet prairies, Ohio, W.; stem angled; leaves green, thickish, 5–7-nerved, mostly entire, the lower lance-oval and tapering into long petioles, the upper short-petioled. Flowers in early summer.

61. ERECHTÌTES, FIREWEED. (An ancient name.) ① (p. 223.)

E. hieracifòlia, Raf. One of the plants called Fireweed, because springing up where woods have been cleared and ground burned over, especially N.; very rank and coarse herb, with strong odor, often hairy, 1°–5° high, with lanceolate or oblong cut-toothed leaves, the upper with auricled clasping base, and panicled or corymbed heads of dull white flowers, in fruit with copious white and very soft downy pappus.

62. CALÉNDULA, MARIGOLD. (Latin *calendæ* or *calends;* flowering through the months.) (p. 226.)

C. officinàlis, Linn. Pot Marigold. Of the Old World; cult. in country gardens, chiefly for the showy flowers, but the heads also sometimes dried and used in culinary preparations; 1° high, spreading, with green and succulent oblong and entire sessile leaves, rather unpleasantly scented, and large head of yellow flowers, produced all summer, sometimes nearly full-double, most of the corollas being strap-shaped. ①

63. XERÁNTHEMUM, EVERLASTING, IMMORTELLE. (Greek: *dry flower.*) (p. 223.)

X. ánnuum, Linn. Leaves linear or oblong, revolute; heads purplish, the scales dry and persistent and very glabrous; 2°–3°. S. Eu.

64. ÁRCTIUM, BURDOCK. (Probably Greek, *bear*, from the spiny involucre.) (p. 222.)

A. Lappa, Linn. Common B. Leaves large, loosely cottony beneath, or somewhat naked, the lower heart-shaped, upper ovate; common in manured soil and barnyards. Var. *minor* is smaller and smoother, with leaves tapering at the base, often cut-toothed or cleft. Flowers mostly purple, all summer and autumn. ① ②

65. CNÌCUS, THISTLE. (Old name.) Flowers purple or pink, occasionally yellow or white, in summer. ② 2 (pp. 221, 222.)

* *All the scales of the head armed with spreading prickly tips.*

C. lanceolàtus, Hoffm. Common or Bull T. Nat. from Eu. in pastures; the base of the rough, deeply pinnatifid leaves running down the stem in lobed prickly wings; flowers purple. ②

* * *All or most of the scales of the head appressed, the innermost not prickly-pointed, the outer with a short prickle or point, or none.*

+ *Leaves green both sides or a little cottony or cobwebby underneath.*

C. arvénsis, Hoffm. Canada T. A vile pest in fields and meadows N., nat. from Eu.; spreading by deep, running roots as well as by seed; numerous short-peduncled heads only 1′ long, with rose-purple flowers; leaves moderately pinnatifid, weak-prickly. 2

C. horrídulus, Pursh. Yellow T. Leaves very prickly, rather large heads surrounded at base by an involucre or whorl of leaf-like very prickly bracts; flowers yellowish or purplish. Sandy fields near the coast, Mass., S.

C. pùmilus, Torr. 1°–3° high, with lance-oblong pinnatifid leaves, single very large heads (almost 2′ across) of fragrant (purple or rarely white) flowers, sometimes leafy-bracted at base. Me. to Pa. ②

C. mùticus, Pursh. Swamps and low ground; 3°–8° high, with deeply divided leaves, few or no prickles, and rather large naked heads, most of the scales pointless; flowers purple. 2

+ + *Leaves white-cottony underneath; flowers purple, rarely white.*

C. altíssimus, Willd. 3°–10° high, branching, leafy up to the rather small heads, the oblong leaves wavy or only slightly pinnatifid, except the lowest. ② 2 Mass. to Minn., S.

Var. **díscolor**, Gray. 3°–6° high, branching and leafy, with rather small heads, and deeply pinnatifid leaves, green above, white beneath, their lobes narrow and prickly pointed. ②

C. Virginiànus, Pursh. Stems rather simple, 1°–3° high, ending in a long naked peduncle; leaves lanceolate and slightly or not at all pinnatifid; head small. 2 Plains and barrens, Va., W. and S.

66. CÝNARA, ARTICHOKE. (Ancient Greek name.) 2 (p. 222.)

C. Cardúnculus, Linn. Cardoon. Leaves deeply and compoundly divided and prickly, the less fleshy scales of the head prickly-tipped; the fleshy leafstalks and midrib eaten after being blanched in the manner of celery. Strong thistle-like plants, 4°–6°. Eu.

C. Scólymus, Artichoke, has less compound leaves, the ovate and usually pointless scales of the involucre and the receptacle of the young flower heads fleshy, and edible when cooked. A modification of the above.

67. CENTAURÈA, CENTAUREA or STAR THISTLE. (*Chiron the Centaur.*) (p. 222.)

* *Flowers all alike in the head, the marginal ones not enlarged and ray-like; pappus of very short bristles; scales of head with dark-fringed appendage.*

C. nìgra, Linn. KNAPWEED. A coarse weed, in fields and waste places E., nat. from Eu.; stem 2° high; leaves roughish, lance-oblong, the lower with some coarse teeth; flowers purple. 2

* * *Marginal flowers more or less enlarged, forming a kind of false ray, and sterile; pappus of bristles; scales of head with fringed appendage.*

C. Cinerària, Linn. (or C. CANDIDÍSSIMA). A low species, cult. from S. Eu., with very white-woolly twice-pinnatifid leaves, and purple flowers, the outermost little enlarged; not hardy N. 2

C. Cỳanus, Linn. BLUEBOTTLE, CORNFLOWER, BACHELOR'S BUTTON. In gardens, from Eu., sparingly running wild; loosely cottony, with stem leaves linear and mostly entire, solitary long-stalked head, the outer flowers very large and blue, with white or rose-colored varieties. ① ②

* * * *Marginal sterile flowers many; pappus of narrow chaff, or none, scales of head naked and smooth. Cult. for ornament, from Asia.*

C. moschàta, Linn. (or C. SUAVÈOLENS; AMBERBÒA MOSCHÀTA and A. ODORÀTA). SWEET SULTAN. Smooth, with mostly pinnatifid leaves, long-stalked head of yellow, rose or white fragrant flowers, the outer ranks enlarged, and chaffy-bristled pappus or 0. ①

68. CÁRTHAMUS, SAFFLOWER, FALSE SAFFRON. (Arabic name, from the properties of the orange-colored flowers, which are used in dyeing or coloring yellow, as a substitute for true Saffron.) (p. 222.)

C. tinctòrius, Linn. Cult. in country gardens, from the Orient; smooth, 6′–12′ high, with ovate-oblong leaves and large head, in summer. ①

69. LÁMPSANA, NIPPLEWORT. (Old Greek name.) (p. 228.)

L. commùnis, Linn. Homely weed E., from Eu.; 1°–2°, nearly smooth, slender; lower leaves ovate and somewhat lyrate; heads yellow, small, in loose panicles. ①

70. KRÍGIA, DWARF DANDELION. (*David Krieg*, a German botanical collector in Md. and Del.)

* ① *Pappus of 5–7 bristles, alternating with a like number of roundish scales.*

K. Virgínica, Willd. Stems several-flowered, 2′–12′ high, branching as they mature; early leaves roundish and entire, the later ones narrow and often pinnatifid. N. and S.

* * 2 *Pappus of 15–20 bristles, and fewer oblong scales.*

K. Dandélion, Nutt. Scape leafless, 6′–18′ high; leaves spatulate-oblong to lanceolate, entire or few lobed; root tuberiferous. Md., S.

K. amplexicaùlis, Nutt. Scape bearing 1–3 oblong or oval clasping, mostly entire leaves; radical leaves toothed or lobed, wing-petioled. N. and S.

71. CICHÒRIUM, SUCCORY, CICHORY, or CHICORY. (Arabic name of the plant.)

C. Íntybus, Linn. Common C. Nat. from Eu. by roadsides, mainly E.; leaves runcinate, rough-hairy on the midrib, or the upper ones on flowering stems, small and bract-like, entire; showy blue flowers opening only in the morning and in cloudy weather; root used as substitute for coffee. Young shoots often grown as a blanched vegetable. 2 (Lessons, Figs. 266, 267, 381.)

C. Endívia, Linn. Endive. Leaves smooth, slightly or deeply toothed, or much cut and crisped; flowering stems leafy, with pink-blue flowers; spreading root leaves used as a salad. Old World. ① ②

72. TRAGOPÒGON, GOAT'S BEARD. (Greek: *goat's beard*, from the pappus.)

T. porrifòlius, Linn. Salsify, Oyster Plant. Cult. from Eu. for the edible tap-root, sometimes running wild; smooth and pale, 2°–4° high, branching, with long leaves tapering from a clasping base to a slender apex, very large heads on hollow peduncle much thickened upwards, and deep violet-purple flowers. ②

T. praténsis, Linn. Leaves broader at the base, and peduncle scarcely thickened; flowers yellow. Nat. from Eu. ②

73. LEÓNTODON, HAWKBIT. (Greek: *lion-tooth*, from the runcinate leaves of some species.)

L. autumnàle, Linn. Fall Dandelion. Nat. from Eu. in meadows and lawns E.; leaves pinnatifid or laciniate; scapes slender, 8′–12′ high, branching; peduncles thickish and scaly-bracted next the small head; flowers summer and autumn. 2

74. HIERÀCIUM, HAWKWEED (which the name means in Greek). Flowers mostly yellow. 2

* *Involucre scarcely imbricated, with no distinct calyculate bracts at its base; pappus copious, in a single series.*

H. aurantìacum, Linn. Low, the stems hirsute and glandular; involucre with dark hairs; scape simple, with the leaves clustered near its base; flowers deep orange or orange-red; akenes oblong and truncate. Eu. In gardens, and escaped.

* * *Involucre distinctly imbricated, or else with calyculate bracts at the base; pappus scant (except in the first), unequal.*

+ *Heads large; involucre imbricated.*

H. Canadénse, Michx. Stems simple, 1°–3° high and leafy up to the corymbed summit; leaves lanceolate or oblong, acute, with a few coarse teeth; heads rather large, with loose imbricated involucre. N.

+ + *Heads small; involucre little imbricated, but calyculate.*

++ *Akenes not tapering upward; panicle rather broad (or not virgate).*

H. paniculàtum, Linn. Stems slender and branching, leafy, 2°–3° high; leaves lanceolate, scarcely toothed; panicle loose, of very small 12–26-flowered heads on slender peduncles, the involucre very simple. N. and S.

H. venòsum, Linn. Rattlesnake Weed. Very smooth or with a few hairs; leaves chiefly at the root, obovate or oblong, thin, purple-tinged beneath and purple-veiny above; scape slender, 1°–2° high, fork-

ing into 2–7 slender peduncles bearing small about 20-flowered heads; akenes linear. N., S. to Ga.

H. scàbrum, Michx. Roughish-hairy, with rather stout simple stem (2°–3° high), bearing obovate or oval nearly entire leaves, and a narrow panicle of many small heads, the 40–50-flowered involucre and stiff peduncles thickly beset with dark glandular bristles. N., S. to Ga.

++ ++ *Akenes tapering at the top; panicle narrow or virgate.*

H. longípilum, Torr. So named from the exceedingly long (often 1′) straight bristly hairs of the stem; leaves narrow-oblong, entire; panicle and 20–30-flowered involucre between the last and the next. Mich., W. and S.

H. Gronòvii, Linn. Stems slender, leafy, and very hairy below; leaves oblong or obovate; heads small; slender peduncles and 20–30-flowered involucre sparingly glandular-bristly. N. and S.

75. PRENÁNTHES (or NÁBALUS), RATTLESNAKE ROOT. (Greek: *drooping blossom.*)

* *Peduncles and 12–40-flowered heads hairy.*

P. racemòsa, Michx. Smooth wand-like stem 2°–5° high; leaves lance-oblong, slightly toothed, the upper ones partly clasping; narrow spiked panicle of about 12-flowered heads. N.

P. áspera, Michx. Similar, but rough-pubescent, the upper leaves not clasping and the 12–14-flowered heads mostly erect and larger. Ohio, W. and S.

P. crepidínea, Michx. Smoother, with stout stem 5°–8° high, wide-corymbed panicles of 20–40-flowered heads, brown pappus, and broad leaves 6′–12′ long on winged petioles. Penn., W. and S.

* * *Peduncles and 5–12-flowered heads smooth; leaves very variable.*

P. altíssima, Linn. Tall R. or White Lettuce. Rich woods N., 3°–6° high, with long and narrow leafy panicle, petioled leaves inclined to be ovate-triangular; heads 5–6-flowered; pappus dirty white.

P. álba, Linn. Common White Lettuce, in open woods, chiefly N. and W.; glaucous, with more corymbed panicles of 8–12-flowered heads, usually more cut or divided leaves, and cinnamon-colored pappus.

P. serpentària, Pursh. Lion's Foot, or Gall of the Earth. Commonest in dry soil E. and S.; 1°–4° high, with narrow-corymbed panicles of 8–12-flowered heads, and pappus dull straw-color.

76. PYRRHOPÁPPUS, FALSE DANDELION. (Greek: *flame-colored pappus;* this and the leafy stems distinguish this genus from the next.) ① ②

P. Caroliniànus, DC. 1°–2° high, with oblong or lanceolate leaves often pinnatifid or cut, the upper partly clasping; flowers spring and summer. Sandy fields from Md., S.

77. TARÁXACUM, DANDELION. (Greek name referring to medicinal properties of the root.) ② 𝔙 (Lessons, Fig. 384.)

T. officinàle, Weber. Common D. In all fields, from spring to autumn. Inner involucre closes after blossoming till the akenes mature and the beak lengthens and elevates the pappus; then the involucre is reflexed, the pappus spreads, and with the fruit is blown away by the wind. Very variable. Eu.

78. CHONDRÍLLA. (Ancient name.)

C. júncea, Linn. Branching herb, smooth above but bristly below, 1°–3°, with wand-like stems; root leaves runcinate; stem leaves few and small, linear; small yellow heads scattered on the nearly leafless branches. Weed E. Eu. ②

79. LACTÙCA, LETTUCE. (Latin: *milk*, from the juice.) ②

* *Akenes very flat, with a long filiform beak. Flowers mostly yellowish.*

L. Scarìola, Linn. Prickly Lettuce. Tall (3°–5°) and coarse weed from Eu.; stem sparsely prickly or bristly below, as also the mid-rib on the under surface of the oblong spinulose leaves; heads small and yellow.

L. satìva, Linn. Garden Lettuce. Supposed to be derived from the above; the broad and tender root leaves used for salad; stem leaves, as in the above species, standing edgewise, often exhibiting polarity.

L. Canadénsis, Linn. Wild Lettuce. Tall and very leafy (4°–9°), smooth or very nearly so and glaucous; leaves sinuate-pinnatifid, the upper lanceolate and entire; yellow heads in a long panicle. Common, N. and S.

L. integrifòlia, Bigel. Rather lower and less leafy; leaves undivided, oblong-lanceolate, pointed, entire or denticulate; heads yellow or purplish. N. and S.

L. hirsùta, Muhl. Stems generally reddish, 2°–4°, hirsute below, not very leafy; leaves runcinate-pinnatifid, more or less hirsute; heads purplish-yellow or rarely whitish. N. and S.

* * *Akenes oblong and thickish, contracted into a short and thick neck; flowers mostly blue.*

L. acuminàta, Gray. 3°–6° high, with ovate or lance-ovate barely serrate leaves on winged petioles, blue flowers, and bright white pappus. N. and S.

L. Floridàna, Gærtn. Penn. W. and S.; like the last, but with all the leaves or the lower ones lyrate or runcinate, uppermost partly clasping.

L. leucophæa, Gray. Resembles Wild Lettuce, and with equally variable lanceolate or oblong often irregularly pinnatifid leaves, very compound panicle of pale blue or bluish-white flowers, and tawny pappus. Low grounds.

80. SÓNCHUS, SOW THISTLE. (Ancient Greek name.) Coarse weeds, with soft-spiny-toothed runcinate-pinnatifid leaves; nat. from Eu. (Lessons, Fig. 383.)

* ① *Heads pale yellow.*

S. oleràceus, Linn. In manured soil and damp waste places; 1°–5° high, with acute auricles to the clasping base of the leaves, pale yellow flowers, and akenes wrinkled transversely.

S. ásper, Vill. Like the last, but the leaves less divided and more spiny-toothed, the auricles of their clasping base rounded, and akenes smooth with 3 nerves on each side.

* * ♃ *Heads larger, bright yellow.*

S. arvénsis, Linn.; 1°–2° high from creeping rootstocks, with bristly peduncles and involucre.

LXII. LOBELIACEÆ, LOBELIA FAMILY.

Plants with milky, acrid juice, alternate, simple leaves, and scattered, racemed or panicled flowers; the calyx tube adherent to the many-seeded ovary and pod; the corolla irregularly 5-lobed and mostly split down, as it were, on the upper side; the 5 stamens united into a tube commonly by their filaments and always by their anthers; style only one.

1. LOBÈLIA. (Named after the herbalist *De l' Obel* or *Lobel.*) Tube of the calyx and 2-celled pod short. Corolla split down on one side, the 5 lobes more or less irregular or unequal. Two or all 5 anthers bearded at top. (Lessons, Fig. 285.)

* *Corolla normally deep red; stems tall and simple.*

L. cardinàlis, Linn. CARDINAL FLOWER. Leaves lance-oblong; raceme erect, of large and showy flowers, which are very rarely rose-colored or even white. ② 2 Cult.

* * *Flowers blue or with some white in the throat.*

+ *Stems very diffuse, almost trailing.*

L. Erìnus, Linn. The common low and spreading little Lobelia of conservatories and summer gardens, variable, grown under many names; flowers abundant, small, azure-blue, usually white in the throat; upper leaves narrow, toothed, the lowest spatulate. ① Cape of Good Hope.

+ + *Stems strict.*

++ *Flowers rather large (½′ or more long); stems always leafy.*

L. syphilítica, Linn. Slightly hairy, 1°–3° high, leafy, with ovate-oblong irregularly toothed leaves, dense leafy raceme, hairy calyx, and corolla (sometimes whitish) almost 1′ long. Low grounds. 2

L. pubérula, Michx. Minutely soft-downy, with blunter and finer-toothed leaves, and rather 1-sided spike of smaller deeper-blue flowers. N. J., S. and W. 2

++ ++ *Flowers small; stems bracteate or only sparingly leafy.*

L. spicàta, Lam. Smoothish, with long and wand-like stems 1°–3° high, lowest leaves obovate, upper ones narrow and small and close, naked raceme of very small flowers. Common. ② 2

L. Kálmii, Linn. Smooth, with branching stems 5′–12′ high, obovate root-leaves, few and lanceolate or linear stem-leaves, a loose raceme of slender-pediceled, small, but handsome, bright-blue flowers, and obovate pods. ② 2 Wet banks N.

L. inflàta, Linn. INDIAN TOBACCO. Somewhat hairy, 9′–18′ high, much branched, with ovate toothed leaves, and spike-like leafy racemes of small flowers, the pale blue corolla only 2″ long, and pod inflated. ① Common in fields; a noted quack medicine.

L. paludòsa, Nutt. Stem slender and scape-like, with one or two bracts; leaves fleshy and scattered at the base of the stem, narrow-spatulate, the margins glandular; flowers azure or nearly white, the lower lip bearded. In water, Del., S.

LXIII. CAMPANULACEÆ, CAMPANULA FAMILY.

Herbs with milky juice, alternate leaves, and scattered flowers, with regular 5-lobed (blue or white) corolla and 5 stamens borne on the summit of the calyx tube which is adherent to the 2–5-celled, many-seeded ovary and pod; style 1; stigmas as many as the cells of the ovary. Stamens separate in all our plants of the order, which by this and by the regular corolla (valvate in the bud) are distinguished from the preceding.

1. SPECULARIA. Corolla nearly wheel-shaped. Stigmas 3. Pod linear or narrow oblong, opening by a lateral valve or short cleft into each cell. Otherwise as in the next.
2. CAMPANULA. Corolla bell-shaped, or of various shapes. Stigmas and cells of the short pod 3–5, each cell of the latter opening by a lateral valve or short cleft.

1. SPECULÀRIA, VENUS'S LOOKING-GLASS. (Old Latin name of European species is *Speculum Veneris.*) ①

S. Spéculum, DC. GARDEN V. Cult. from Eu. for ornament, is a low herb, with oblong leaves, pretty blue flowers terminating the spreading branches, and linear triangular pod.

S. perfoliàta, DC. Weedy plant in sterile or sandy ground, with simple stems 3′–20′ high, furnished throughout with round-heart-shaped clasping leaves, and small flowers in their axils, only the later ones expanding a small blue corolla; pod oblong.

2. CAMPÁNULA, BELLFLOWER or HAREBELL. (Diminutive of Italian or late Latin name for *bell.*) Flowers summer. (Lessons, Fig. 254.)

* *Stigmas and cells of the pod 5; calyx with reflexed leafy appendages.*

C. Mèdium, Linn. CANTERBURY BELLS. Erect, branching, hairy, with coarse toothed leaves, and oblong bell-shaped flowers 2′–3′ long, often double. Cult. Eu. ① ②

* * *Stigmas and cells 3.*

+ *Stem leaves all linear or lance-linear.*

C. aparinoìdes, Pursh. Delicate weak stems 8′–20′ high, and rough backward on the angles, bearing small lance-linear leaves and a few small whitish flowers on diverging peduncles, the bell-shaped corolla 3″–4″ long. Grassy wet places. ♃

C. rotundifòlia, Linn. COMMON HAREBELL. Tufted spreading slender stems 5′–12′ high; round or heart-shaped root leaves, dying early, but narrow mostly linear stem leaves (the specific name therefore unfortunate); flowers few, slender-peduncled, the blue bell-shaped corolla 6″–8″ long, handsome. Rocks N. ♃

+ + *Stem leaves lance-ovate or broader; flowers normally blue.*

++ *Flowers paniculate or scattered, long-peduncled.*

C. Carpática, Jacq. Smooth, tufted, 6′–10′ high, with roundish or ovate petioled small leaves, slender 1-flowered peduncles, and open bell-shaped corolla about 1′ long.

++ ++ Flowers spicate or racemose.

= Style strongly declined and upwardly curved; corolla shallow.

C. Americàna, Linn. Rich moist ground especially W.; stem 3°–6° high, thin, lance-ovate, taper-pointed, serrate leaves, and long loose spike of flowers, the almost wheel-shaped, light-blue corolla 1′ broad, and long curved style. ① ②

= = Style straight; corolla deep.

C. rapunculoìdes, Linn. Spreading inveterately by the root, sparsely hairy, the erect leafy stems 1°–2° high, with lowest leaves heart-shaped and petioled, upper lance-ovate and sessile, nodding flowers in the axil of bracts forming a leafy raceme, and tubular-bell-shaped corolla 1′ long. Cult. and escaped. Eu. 2

C. Trachèlium, Linn. Roughish-hairy, 2°–3° high, with more coarsely toothed and broader leaves than the last, and rather larger bell-shaped corolla. Gardens. Eu. 2

C. persicifòlia, Linn. Smooth, with upright stems 1°–2½° high, and bearing small lance-linear leaves, root leaves broader, all beset with minute, close teeth; the flowers nearly sessile and erect, rather few in a sort of raceme, the open bell-shaped corolla 1½′–2′ long, sometimes double. Cult. Eu. 2

LXIV. ERICACEÆ, HEATH FAMILY.

A very large family, of shrubs, herbs, or even small trees, difficult to define as a whole; the leaves are simple and mostly alternate (sometimes reduced to white or colored scales); the flowers almost all regular, and with as many or twice as many stamens as there are petals or lobes of the corolla; their anthers 2-celled, each cell more commonly opening by a pore or hole at the end; ovary mostly with as many cells as there are lobes to the corolla; style only one, and seeds small. The HEATH and HEATHER (the former cult. in some greenhouses in several species, and the latter sparingly wild E.) belong to this family, and are distinguished by small or needle-like evergreen leaves, the corolla becoming dry and persisting, its lobes, and those of the calyx, 4; stamens 8.

I. WHORTLEBERRY SUBFAMILY, known by having the tube of the calyx adherent to the ovary, on which the monopetalous corolla and the stamens are therefore mounted. All are shrubs, with scaly buds. Fruit a berry or berry-like.

1. GAYLUSSACIA. Stamens 10; anthers with the cells opening by a chink at the blunt or tapering top. Ovary 10-celled with one ovule in each cell, forming a berry-like fruit containing 10 apparent seeds, or properly little stones. Flowers in lateral racemes; branchlets and leaves beset with resinous or clammy dots.

2. VACCINIUM. Stamens 10 or 8; anthers tapering up into a tube with a hole at the top. Ovary with several or many ovules in each cell, forming a pulpy many-seeded (rarely rather few-seeded) berry.

3. CHIOGENES. Stamens 8; anthers with short cells minutely 2-pointed, and opening by a large chink down to the middle. Ovary 4-celled, in fruit a white many-seeded berry.

II. HEATH SUBFAMILY PROPER; shrubs or small trees with calyx free from the ovary.

* *Monopetalous (or in one of No.* 12 *with two of the petals nearly separate).*

\+ *Fruit berry-like, containing* 5–8 *seeds or very small stones.*

4. ARCTOSTAPHYLOS. Corolla urn-shaped, 5-toothed, inclosing the 10 stamens; their anthers opening at the top, and 2-awned on the back. Drupe 5–10-seeded. Calyx dry underneath. Leaves alternate.

5. GAULTHERIA. Corolla oblong or short-cylindrical, 5-toothed. Anthers 10, 4-awned or 4-pointed at top, opening only there. Fruit a dry and many-seeded pod, but inclosed in the calyx which becomes thick and fleshy, so that the fruit imitates a berry, but has a dry pod inside. (Lessons, Figs. 366, 367.) Leaves alternate, broad, often spicy-aromatic, evergreen.

\+ \+ *Fruit dry, not berry-like; calyx separate from the pod.*

\+\+ *Corolla salver-shaped,* 5-*lobed; anthers opening lengthwise, not appendaged.*

6. EPIGÆA. Sepals 5, thin and scale-like, ovate-lanceolate, style slender. Leaves evergreen, reticulated, roundish.

\+\+ \+\+ *Corolla cylindrical, urn-shaped, ovate, or globular, very rarely bell-shaped, the orifice* 5-*toothed; anthers opening wholly or mainly at the top.*

7. ANDROMEDA. Calyx valvate in the early bud; no bractlets. Corolla various. Pod globular or short-ovate, 5-valved, loculicidal. Shrubs.

8. OXYDENDRUM. Calyx valvate in the bud; no bractlets. Corolla ovate. Anthers awnless. Pod conical or pyramidal, 5-valved, loculicidal. Tree.

9. LEUCOTHOE. Calyx of 5 almost separate sepals a little overlapping in the bud. Corolla ovate-oblong or almost cylindrical. Anthers without tubular tips. Pod flattish from above, 5-valved, loculicidal. Shrubs.

10. CASSANDRA. Calyx of 5 ovate and acute rigid sepals overlapping in the bud, and a pair of similar bractlets at its base. Corolla almost cylindrical. Anthers with tubular tips to the cells, and no awns on the back. Pod flattish from above, when ripe splitting into an outer layer of 5 valves and an inner cartilaginous one of 10 valves. Shrub, with leaves rather scurfy.

\+\+ \+\+ \+\+ *Corolla (usually large) open bell-shaped, saucer-shaped, funnel-form, etc.,* 5-*lobed or cleft; anthers short, without awns or other appendages, opening only by holes at the top; filaments long and slender, as is also the style; pod septicidal; leaves entire.*

= *No scaly buds; bracts green, firm and persistent.*

11. KALMIA. Corolla broadly open, slightly 5-lobed, and with 10 pouches in which the 10 anthers are lodged until extricated by insects, when the bent elastic filaments fly up and discharge the pollen. Pod globular. Leaves evergreen. Flowers in umbels or corymb-like clusters.

== *Flowers in umbel like clusters, from large, scaly, terminal buds, their thin scale-like bracts or bud scales falling as the blossoms are developed. Calyx often minute or obsolete.*

12. RHODODENDRON. Corolla bell-shaped, funnel-form, or various, in one species strongly irregular, the upper part 3-lobed, the lower of 2 almost or quite separate petals. Stamens 5–10, often curved to the lower side. Leaves evergreen, or deciduous. Pod mostly oblong.

* * *Polypetalous or nearly so; the (white) corolla of 5 equal petals, widely spreading, oval or obovate; leaves evergreen; flowers in a terminal umbel.*

13. LEDUM. Stamens 5–10; anthers opening by holes at top. Pod 5-celled. Leaves alternate, thinnish, rusty-woolly underneath. Flowers from scaly terminal buds, as in Rhododendron.

14. LEIOPHYLLUM. Stamens 10; anthers opening lengthwise. Pod 2–5-celled. Leaves small, smooth both sides, glossy, mostly opposite.

III. PYROLA SUBFAMILY. Shrubs, or evergreen herbs, with calyx free from the ovary, corolla of separate petals, anthers turned outwards in the bud, soon inverted, when the holes by which they open are at top (or at bottom in Clethra). Seeds innumerable, with a loose cellular coat.

* *Shrubs; leaves deciduous; flowers in hoary racemes; capsule 3-celled.*

15. CLETHRA. Sepals and obovate-oblong petals 5. Stamens 10; anthers arrow-shaped and reflexed in the bud, the hole at the top of each cell then at the bottom. Style 3-cleft at the apex. Pod inclosed in the calyx. Leaves alternate, serrate, feather-veined, deciduous.

* * *Herbs, or very nearly so, low; leaves evergreen; capsule 4–5-celled.*

16. CHIMAPHILA. Flowers several in a corymb or umbel, with orbicular, widely spreading petals, 2-horned anthers on filaments enlarged and hairy in the middle. Very short, top-shaped style covered by a broad, orbicular, stigma, and valves of pod smooth on the edges. Stems leafy below; leaves narrow, smooth, and glossy.

17. MONESES. Flower solitary, with orbicular widely spreading (sometimes only 4) petals, conspicuously 2-horned anthers, large, 5-rayed stigma on a straight style, and pod as in the last genus; otherwise like Pyrola.

18. PYROLA. Flowers in a raceme on a scape which bears rounded leaves at base. Petals roundish, more or less concave. Stamens 10, with awl-shaped filaments. Style long. Valves of pod cobwebby on the edges.

IV. INDIAN PIPE SUBFAMILY. Herbs destitute of green foliage, parasitic on roots of other plants; flowers much as in III.; commonly represented by one genus.

19. MONOTROPA. Calyx of 2 or more deciduous bract-like scales. Corolla of 4 or 5 erect spatulate or wedge-shaped petals, resembling the scales of the stem. Stamens 8 or 10; anthers kidney-shaped, opening across the top; style stout; stigma depressed. Pod 4–5-celled, seeds innumerable, minute, resembling fine sawdust.

1. GAYLUSSÁCIA, HUCKLEBERRY. (Named for the French chemist, *Gay-Lussac.*) Flowers white tinged with reddish, in late spring; the edible fruit ripe late in summer, that of the last species sometimes gathered from the market. Huckleberry is a name of indefinite application. It is generally applied to the black-fruited species of this genus and the next; while Blueberry is used for the glaucous-blue species.

G. dumòsa, Torr. & Gray. Dwarf H. Rather hairy or bristly, with thickish, rather shining, oblong leaves, long racemes, leaf-like oval bracts to the pedicels, bell-shaped corolla, and insipid black fruit. Sandy soil near the coast.

G. frondòsa, Torr. & Gray. Blue Tangle or Dangleberry. Branches diverging, slender; leaves pale, white beneath; racemes and pedicels slender; corolla short; sweet blue-black fruit with a bloom. N. Eng., S.

G. resinòsa, Torr. & Gray. Common or Black H. 1°–3° high, clammy-resinous when young, with rigid branches, oval leaves, short one-sided racemes in clusters, rather cylindrical corolla, and black fruit without a bloom. Woods.

2. VACCÍNIUM, BLUEBERRY, CRANBERRY, &c. (Ancient Latin name, of obscure meaning.) (Lessons, Fig. 274.)

* Farkleberry and Deerberry; *erect shrubs with single axillary or racemed flowers on slender pedicels, in early summer, open bell-shaped corolla, 10 stamens, anthers with very slender tubes, and 2 awns on the back, and insipid berries ripening late, each of their 5 cells divided in 2, and maturing few seeds.*

V. arbòreum, Marsh. Farkleberry. Open woods from Va. and S. Ill. S.; 8°–15° high, evergreen far S., with oval, glossy leaves, anthers included in the 5-toothed, white corolla, and black mealy berries.

V. stamíneum, Linn. Deerberry or Squaw Huckleberry. 2°–3° high, rather downy, with dull and pale ovate or oval leaves, anthers much longer than the greenish or whitish 5-cleft corolla, and large greenish berries. Me., W. and S.

* * Evergreen Blueberries *of the South, in low pine barrens, procumbent or only 1°–2° high, with 5-toothed corolla and 10 stamens.*

V. Myrsinìtes, Lam. Stems 6′–25′ high; leaves lanceolate or lance-obovate ½′–1′ long and mostly pale beneath; berries black or blue.

V. crassifòlium, Andr. Stems procumbent, slender; thick and shining oval or oblong leaves ½′ or less in length, their margins revolute; globular-bell-shaped corolla; berries black.

* * * Blueberries, beyond New England commonly called Huckleberries, *with leaves deciduous at least in the Northern States; flowers in spring in clusters from scaly buds separate from and rather earlier than the leaves; corolla oblong or short cylindrical, 5-toothed, inclosing the 10 anthers; berries ripe in summer, sweet, blue or black with a bloom, each of the 5 many-seeded cells divided into two.*

V. virgàtum, Ait. Low, pubescent; leaves ovate or cuneate-oblong, acute and minutely serrulate; flower clusters on naked branches; corolla rose-color; berry black. S. Car., S.

Var. **tenéllum**, Gray. Low grounds from Va. S.; small-leaved, with smaller nearly white flowers in shorter clusters.

V. Pennsylvánicum, Lam. Dwarf Early Blueberry. Dry or barely moist grounds N.; 6′–15′ high, with green, angular branches, mostly lance-oblong leaves, bristly-serrulate and smooth and shining both sides, the sweet berries earliest to ripen.

V. Canadénse, Kalm. Taller, 1°–2° high, the broader entire leaves and branchlets downy. N.

V. vacíllans, Solander. Low Pale B. Dry woodlands, N., and S. to N. C.; 1°–3° high, with yellowish branches, smooth and pale or glaucous leaves obovate or oval and entire, and berries ripening later than V. Pennsylvanicum. Fruit much prized.

V. corymbòsum, Linn. Common Swamp B. 3°–10° high, with oval or oblong leaves, either smooth or downy, pale or green, and sweetish berries ripening in late summer; in one downy-leaved variety, pure black without a bloom. Swamps. Much gathered for market. Very variable.

* * * * Cranberry; *creeping or trailing, very slender, hardly woody plants, with small evergreen leaves whitish beneath, single flowers in summer, borne on slender erect pedicels, pale rose corolla, deeply parted into 4 narrow reflexed divisions, 8 anthers with very long tubes, but no awns on the back, and acid red berry 4-celled, ripe in autumn.* (Lessons, Fig. 274.)

V. Oxycóccus, Linn. Small C. Cold peat bogs N. and E.; a delicate little plant, flowering at the end of the stems, the ovate acute leaves (only ¼′ long) with strongly revolute margins; berry only half as large as in the next, often speckled with white, seldom gathered for market.

V. macrocárpon, Ait. Large or American C. Stems 1° to 3° long, growing on so that the flowers become lateral, oblong obtuse leaves sometimes ½′ long, and with less revolute margins, and berries ½′ or more long; largely cultivated for the market. Bogs from N. C., N. (Lessons, Fig. 371.)

3. **CHIÓGENES.** (Greek-made name, alluding to the snow-white berries.) ♃

C. serpyllifòlia, Salisb. Creeping Snowberry. Peat bogs and mossy woods N., and S. to N. C. in Mts.; nearly herbaceous, slender, creeping stems, very small, ovate, pointed evergreen leaves, their lower surface and the branchlets beset with rusty bristles, minute axillary flowers in late spring, and white berries ripe in summer; these and the foliage have the flavor of Wintergreen.

4. **ARCTOSTÁPHYLOS**, BEARBERRY (the name in Greek). ♃

A. Ùva-Úrsi, Spreng. Trailing over rocks and bare hills N., forming mats, with thick, smooth, and entire obovate and spatulate evergreen leaves, and small scaly-bracted nearly white flowers in a short raceme, in early spring, followed by the red austere berries. Leaves used in medicine, astringent and somewhat mucilaginous.

5. **GAULTHÈRIA**, WINTERGREEN. (Named for *Dr. Gaulthier* of Quebec.) (Lessons, Figs. 366, 367.) ♃

G. procúmbens, Linn. Creeping W., Boxberry, Checkerberry, etc.; common in evergreen and low woods, spreading by long and slender mostly subterranean runners, sending up stems 3′–5′ high, bearing at summit a few obovate or oval leaves and in summer one or two nodding white flowers in the axils, the edible red "berries" lasting over winter; these and the foliage familiar for their spicy flavor, yielding the *oil of wintergreen.*

6. **EPIGÆA.** (Greek: *on the ground*, from the growth.) ♃

E. rèpens, Linn. Trailing Arbutus (pronounced *Ar'butus*), Ground Laurel, or, in N. Eng., Mayflower. Sandy or rocky woods, chiefly E., under pines, etc.; prostrate, with rusty-bristly shoots, somewhat heart-shaped leaves, slender-petioled, and small clusters of rose-colored or almost white spicy-fragrant flowers (which are dimorphous) in early spring.

7. **ANDRÓMEDA.** (Mythological name.) Flowers white, rarely tinged with rose, mostly in spring.

* *Flowers in umbel-like clusters; leaves evergreen; anthers 2-awned.*

A. polifòlia, Linn. Cold wet bogs N.; 6′–18′ high, smooth and glaucous; lanceolate entire revolute leaves white beneath: flowers in a simple terminal umbel, the corolla almost globular.

A. nítida, Bartr. Low pine barrens, N. C., S.; 2°–4° high, very smooth, with 3-angled branchlets, ovate or oblong, and entire glossy leaves, abundant honey-scented flowers in numerous axillary clusters, and ovate-cylindrical corolla.

* * *Flowers in naked one-sided racemes crowded at the ends of the branches, formed in summer and opening early the next spring; leaves evergreen; anthers awned.*

A. floribúnda, Pursh. 3°–10° high, very leafy, the lance-oblong acute leaves serrulate, with very fine bristly teeth, abundance of handsome flowers, the ovate-urn-shaped corolla strongly 5-angled; along the Alleghanies S., and planted.

* * * *Flowers in umbel-like clusters on wood of the previous year, in late spring or early summer; leaves mostly deciduous, but often thickish or coriaceous; pods 5-angled by a prominent rib or ridge at the lines of opening.*

+ *Flowers ½′ or more long, nodding, smooth, clustered mostly on leafless shoots; stamens 2-awned, or toothed. Smooth ornamental shrubs, 2°–4° high.*

A. speciòsa, Michx. Low barrens S., barely hardy N. in cultivation; with oval or oblong blunt and serrate leaves, often mealy-whitened; corolla open bell-shaped.

A. Mariàna, Linn. Staggerbush (the foliage said to poison lambs and calves). Low grounds E. and S.; with glossy oval or oblong entire veiny leaves, and leaf-like lanceolate sepals, half the length of the almost cylindrical corolla.

+ + *Flowers very small, with globular and scurfy-pubescent corolla; stamens awnless. Rusty pubescent or scurfy shrubs, 4°–10° high.*

A. ferrugínea, Walt. Low sandy grounds S. C., S., with thick and rigid mostly evergreen, rusty, obovate leaves, the margins revolute.

A. ligustrìna, Muhl. Leaves thin and green, obovate-oblong; panicled clusters of small flowers. Can., S.

8. **OXYDÉNDRUM**, SORREL TREE, SOURWOOD. (Both the Greek-made and English names refer to the sour-tasted leaves.)

O. arbòreum, DC. Rich woods, Penn. to Ind., and S.; tree 15°–40° high, smooth, with oblong-lanceolate, pointed, serrulate leaves (resembling those of the Peach), on slender petioles, and white flowers in long one-sided racemes clustered in a loose panicle at the end of the branches of the season, in early summer.

9. **LEUCÓTHOË**. (Mythological name.) Flowers white, in naked scaly-bracted racemes or spikes, which are formed in summer and open the next year.

* *Evergreens on moist banks of streams, with very smooth and glossy, finely and sharply serrate leaves; the rather catkin-like dense racemes sessile in their axils; bractlets at the base of the short pedicels; flowers in spring, exhaling the scent of Chestnut blossoms.*

L. Catesbæi, Gray. Abounds from Va. S., along and near the mountains; has long recurving branches, ovate-lanceolate and very taper-pointed leaves on conspicuous petioles, and narrowish sepals.

L. axillàris, Don. Broader, less pointed leaves, on very short petioles, and broad-ovate sepals. Low country S.; flowers very early.

* * *Deciduous-leaved, with one-sided looser racemes at the ends of the branches; flowering in late spring or summer after the membranaceous leaves are developed; bractlets close to the calyx, acute.*

L. racemòsa, Gray. Erect, 4°–8° high, with oblong, acute, serrulate leaves a little downy beneath, long and upright racemes, and 4-awned anthers. Mass., S.

10. CASSÁNDRA, LEATHERLEAF. (A mythological name.)

C. calyculàta, Don. Wet bogs N. and mostly E.; low, much-branched shrub, with small and nearly evergreen dull oblong leaves sprinkled with some fine scurf or scaly atoms, and small white flowers in the axils of the upper leaves, forming one-sided leafy racemes, in early spring. Common.

11. KÁLMIA, AMERICAN or MOUNTAIN LAUREL. (Named for *Peter Kalm*, pupil of Linnæus, who traveled in this country before the middle of the last century.) Ornamental shrubs, scarcely found W. Flowers spring and early summer.

K. latifòlia, Linn. Large Mountain L.; also Calico Bush, Spoonwood, etc., in Middle States. Common N. in damp grounds and along the mountains S., where it forms very dense thickets, 4°–10° or even 20° high, with mostly alternate lance-ovate leaves, bright green both sides; the large and showy clusters of rose-color or white or crimson-spotted flowers terminal and clammy, in early summer. Planted.

K. angustifòlia, Linn. Sheep L. Lambkill. 2°–3° high, with narrow-oblong, short-petioled leaves opposite or in threes and pale beneath, and corymbs of smaller crimson-purple flowers lateral (in late spring), their pedicels recurved in fruit. N., S. to Ga.

K. glaùca, Ait. Cold bogs N.; 1°–2° high, with 2-edged branches, opposite, sessile, oblong or linear leaves white beneath and with revolute margins, the corymbs of lilac-purple flowers terminal, in spring.

12. RHODODÉNDRON, ROSEBAY, AZALEA. (The name in Greek means *rose tree*.) Very ornamental shrubs or small trees, the fancy varieties much confused as to species.

* True Azaleas or False Honeysuckles, *with deciduous leaves, slender cylindrical tube to the corolla, the chiefly 5 stamens and the style long and protruded; hardy ornamental shrubs.*

← *Flowers developed later than the leaves, in summer, very fragrant.*

R. viscòsum, Torr. White Swamp Honeysuckle. 4°–10° high, with bristly branchlets, oblong-obovate, mostly smooth leaves commonly pale or whitish beneath, often glossy above, and white or rosy-tinged very clammy flowers. Swamps E. and S.

← ← *Flowers developed with or rather before the thin and veiny mostly pubescent leaves, in late spring.*

R. nudiflòrum, Torr. Purple A. or Pinkster Flower. Swamps and woods, chiefly E. and S., also cult.; 3°–6° high, with oblong or obovate leaves; branchlets and narrow tube of the rose or pink-red corolla rather glandular-pubescent, and calyx very small; slightly fragrant.

R. calendulàceum, Torr. In and near the Alleghanies, especially S., and cult.; has yellow or flame-colored corolla and larger calyx lobes than the preceding; not fragrant.

R. flàvum, Don. (Azàlea Póntica.) Planted from the Old World, a native of the Caucasus; has large (2′ or more broad) golden or orange-

yellow flowers, terminating naked branches, the tube clammy-downy; leaves large and oblong-obovate. Less cult. in this country than the next.

R. Sinénse, Sweet. GARDEN AZALEA. Bushy shrub, with clusters of mostly shorter red or yellow flowers on leafy branches; leaves smaller, oval or elliptic. Two types are in cultivation. One, the GHENT AZALEA, commonly called AZÀLEA SINÉNSIS by gardeners, has flowers with narrow corolla tube which appear with the leaves. The other type, called A. MÓLLIS, has broader flowers which appear in advance of the leaves.

* * RHODORA. *Leaves deciduous; corolla strongly irregular, the upper part 3-lobed, the lower of 2 nearly or quite separate pieces; 10 stamens and the style protruded.*

R. Rhodòra, Don. Cold wet grounds, from Penn. N. and E.; low shrub, with handsome rose-pink flowers in spring, somewhat earlier than the pale, rather hairy leaves.

* * * CHINESE AZALEAS, *with thickish almost or quite evergreen leaves, rather leafy calyx, short-tubed corolla approaching to bell-shaped, and often 10 stamens, the latter and the style scarcely or not at all exserted.*

R. Índicum, Sweet (or AZÀLEA ÍNDICA). Cult. from China and Japan, etc.; is however the AZALEA of florists, flowering in late winter and early spring in conservatories, with red, purple, pink, white, or variegated showy flowers, green rather shining leaves, and shoots beset with appressed awl-shaped rusty bristles.

* * * * RHODODENDRON PROPER. *Leaves thick and usually persistent; stamens generally 10, which, like the style, are somewhat declined or equally spreading, but rarely exserted.*

– *Leaves thick and evergreen, smooth; branches stiff and erect; flowers in early summer from very large terminal buds; corolla broadly bell-shaped.*

R. máximum, Linn. GREAT R. or WILD LAUREL. Mountain sides, abundant through the Alleghanies, and N., sparingly to Me. and Can.; 6°–20° high, with lance-oblong leaves (4′–10′ long) narrowish below, clammy pedicels, and pale rose or nearly white corolla (1′ broad), greenish in the throat, on the upper side more or less spotted with yellow or reddish; flowers midsummer.

R. Catawbiénse, Michx. High Alleghanies from Va. S., and planted; 3°–6° high, with oval or oblong leaves rounded at both ends and pale beneath (3′–5′ long), usually rusty pedicels, and large, light purple or lilac corolla; flowers early summer. This, hybridized with other less hardy species, especially with the next, and with the tender **R. arbòreum**, Smith, of the Himalayas (cult. in conservatories), gives rise to most of the various Rhododendrons of ornamental grounds. The forms partaking most largely of Catawbiense characteristics are distinguished by broad and flat, slightly obovate and broad-pointed, glossy leaves, and by mauve or light blue-purple flowers.

R. Pónticum, Linn. From Asia Minor, hardy when planted N. only as a low shrub, has obovate-lanceolate leaves tapering to the base, and a very open bell-shaped dark purple corolla, in late spring. Ponticum varieties have narrow leaves with narrow points, with a tendency to become revolute and less glossy than the Catawbiense type, and by less pronounced lilac or mauve tints.

– – *Leaves evergreen, but thinnish; branches slender and spreading or drooping, roughish; flowers in early summer*

R. punctàtum, Andr. Along the mountains from N. C., S., and sparingly planted; 4°–6° high, with oblong or lance-oblong leaves acute at

both ends, 2′–4′ long, and sprinkled, like the branchlets and outside of the rather small, short, funnel-shaped, rose-colored corolla, with rusty dots or atoms.

13. **LÈDUM**, LABRADOR TEA. (An old Greek name.) Flowers early summer.

L. latifòlium, Ait. Low and damp or wet grounds from Penn. N.; 2°–5° high, with oblong leaves, usually 5 stamens, and oblong pods.

14. **LEIOPHÝLLUM**, SAND MYRTLE. (Name from the Greek, meaning *smooth leaf.*)

L. buxifòlium, Ell. Evergreen shrub a few inches high, much branched, with oval or oblong Myrtle-like leaves (from ¼′ to nearly ½′ long), and umbels of small white flowers in late spring. In sand, from N. J., S.

15. **CLÈTHRA**, WHITE ALDER. (Old Greek name of *alder*, from some resemblance in the foliage.) Flowers in summer.

C. alnifòlia, Linn. Low grounds; 3°–10° high with wedge-obovate, sharply serrate, straight-veined leaves, and pretty, upright panicled racemes of fragrant, small flowers.

16. **CHIMÁPHILA**, PIPSISSEWA or PRINCE'S PINE. (Name from Greek, means *lover of winter*, i.e. Wintergreen.) Plants of dry or moist woods, branched at base, 3′–10′ high, with fragrant, wax-like, mostly flesh-colored flowers, in early summer. 2

C. umbellàta, Nutt. Leaves wedge-lanceolate, sharply serrate, not spotted; flowers 4–7, with violet-colored anthers.

C. maculàta, Pursh. Lower, 3′–6′ high, with ovate-lanceolate, remotely toothed leaves, blotched with white, and 1–5 flowers.

17. **MONÈSES**, ONE-FLOWERED PYROLA. (Name from the Greek, refers to the solitary flower.) Flowering in early summer. 2

M. grandiflòra, Salisb. Cold woods N. E.; with roundish and serrate veiny leaves about 1′ long, scape 2′–4′ high, and rather large white or rose-colored flower.

18. **PÝROLA**, WINTERGREEN, SHIN LEAF. (Old name, diminutive of *Pyrus*, the Pear tree, the application not obvious.) Flowers mostly greenish-white, in summer. 2 (Lessons, Fig. 307.)

* *Flowers all turned to one side, rather spreading than nodding, the petals conniving; stamens and style straight; stigma large and 5-rayed.*

P. secúnda, Linn. Rich woods N. and E.; slender, 3′–6′ high, with thin, ovate leaves and dense, spike-like raceme.

* * *Flowers nodding, the petals partly expanding, the hanging style more or less curved, tipped with a narrow stigma, and stamens ascending.*

P. chlorántha, Swartz. Scape 5′–6′ high, with a few greenish-white flowers, thick but dull roundish leaves only 1′ long, and anthers short-horned. Open woods N.

P. ellíptica, Nutt. SHIN LEAF. Taller; leaves thinnish and dull, upright, on rather long and margined petioles; the greenish-white flowers nearly as in the following. Md., N. and W.

P. rotundifòlia, Linn. Damp or sandy woods; has thick and shining round leaves on short petioles, many-flowered raceme, and blunt anthers; a variety in bogs has rose-purple flowers. Very variable in shape of leaves.

19. MONÓTROPA, INDIAN PIPE. (Name from the Greek, refers to the flower or summit of the stem turned over to one side or hanging; in fruit it straightens.) Flowers summer. Parasitic on the roots of trees.

M. uniflòra, Linn. COMMON INDIAN PIPE OR CORPSE PLANT. Rich woods; smooth, waxy-white all over (turning black in drying), 3′–6′ high, with one rather large nodding flower of 5 petals and 10 stamens.

M. Hypópitys, Linn. PINESAP OR FALSE BEECH DROPS. In Oak and Pine woods; rather downy, tawny or reddish, fragrant, 4′–12′ high, with several smallish flowers in a scaly raceme, having 4 petals and 8 stamens, or the uppermost 5 petals and 10 stamens.

LXV. DIAPENSIACEÆ, DIAPENSIA FAMILY.

Low and prostrate or tufted plants, herbaceous or soft-woody, glabrous or nearly so; leaves small and simple, without stipules; flowers regular, all the parts in 5's, except the ovary, which is 3-celled and with a single 3-lobed style; stamens adnate to the corolla and sometimes united together, and those opposite the lobes of the corolla (if any) reduced to staminodia.

1. PYXIDANTHERA. Staminodia absent. Flowers solitary and sessile on short, leafy branchlets. Calyx conspicuously bracteate.
2. GALAX. Staminodia present. Flowers in a narrow spike on a slender, naked scape. Calyx minutely 2-bracteolate.

1. PYXIDANTHÈRA. (Greek: *small box, anther.*) 2

P. barbulàta, Michx. PIXY, FLOWERING MOSS. A handsome, trailing little plant in the sandy pine barrens of N. J. and S., flowering in early spring; leaves small and linear-oblanceolate, sharp-pointed; flowers (appearing as if clustered, from the shortness of the branchlets) very numerous, white or blush; anther cells awn-pointed at the base, opening by a transverse line.

2. GÀLAX. (Greek: *milk*, of no application.) 2

G. aphýlla, Linn. Leaves Pyrola-like, round-heart-shaped and crenate, tufted from scaly creeping rootstocks; scape 1°–2°, bearing a wand-like raceme or spike of small white flowers; in open woods, Va., S.

LXVI. PLUMBAGINACEÆ, LEADWORT FAMILY.

Known by the flowers with parts five throughout, viz. 5-lobed plaited calyx, 5 stamens opposite as many petals or lobes of the corolla and almost separate from them, 5 styles or 5 stigmas, and the free ovary 1-celled, containing a single ovule hanging on a slender stalk which rises from its base; the fruit a small utricle.

§ 1. *Low hardy herbs, with leaves all from the root, and flowers on scapes, having a funnel-shaped scarious calyx, nearly or quite separate petals tapering at base, and 5 almost or quite separate styles.*

1. ARMERIA. Tufted plants with evergreen, very narrow and entire leaves, simple scapes bearing a head of rose-colored flowers, and styles plumose-hairy towards the base.
2. STATICE. Broadish-leaved herbs, with scapes branching into a panicle, bearing 3-bracted flowers or clusters; styles smooth.

§ 2. *Plants of warm regions, with branching, mostly woody stems, bearing alternate, entire leaves, and bracted spikes of handsome flowers, having a tubular calyx and corolla, and one style bearing 5 stigmas.*

3. PLUMBAGO. Calyx 5-toothed at the apex, glandular along the 5 ribs or angles. Corolla salver-form, with long tube. Stamens free from the corolla.
4. CERATOSTIGMA. Calyx strongly 5-toothed, 10-ribbed at the base, glandless. Stamens adnate to the corolla tube at its middle.

1. ARMÈRIA, THRIFT. (Old name.) Flowers summer. 2l

A. elongàta, Hoffm. (or A. VULGÀRIS; also called A. MARÍTIMA). COMMON THRIFT. Wild on shores of Eu. and Arctic America, cult. in gardens for edgings, etc., with short, spreading, grass-like leaves and scape 3′–6′ high.

2. STÁTICE. (Ancient Greek: meaning *astringent*, the roots used as such in popular medicine.) A few species of the Old World are cult. in choice gardens, but not commonly. 2l

S. Limònium, Linn. SEA LAVENDER or MARSH ROSEMARY. Along the coast in salt marshes in several varieties, with oblong or spatulate thick and pale leaves on slender petioles, scapes 1°–2° high, bearing lavender-colored flowers all summer.

S. sinuàta, Linn. Cult. from S. Eu.; leaves runcinate or sinuate-lobed and hairy; scape dichotomously branched, strongly winged, as are also the peduncles of the clusters of handsome lilac flowers.

3. PLUMBÀGO, LEADWORT (which the Latin name denotes.) The following are cult. in conservatories, or turned out to flower all summer.

* *Flowers blue or violet.*

P. Capénsis, Thunb. Stems somewhat climbing, angled; leaves oblong-spatulate, entire; corolla large, pale or lead-blue, the tube 1½′ long; calyx tube glandular-hispid. S. Africa.

* * *Flowers red.*

P. coccínea, DC. Herbaceous; leaves large, oblong, the showy flowers in terminal or axillary spikes. E. Indies.

* * * *Flowers white.*

P. Zeylánica, Linn. Stem somewhat climbing, angled; leaves ovate or oblong; flowers in long spikes, the calyx tube glabrous or minutely glandular. E. Indies.

4. CERATOSTÍGMA. (Greek: *horn, stigma.*) 2l

C. plumbaginoìdes, Bunge (or PLUMBÀGO LARPÉNTÆ). Stem slender and zigzag, somewhat hairy and scaly; leaves firm, obovate, finely serrate; flowers violet, in close terminal clusters. Houses and borders, not yet common. China.

LXVII. PRIMULACEÆ, PRIMROSE FAMILY.

Herbs with regular perfect flowers, the stamens borne on the corolla and as many as its divisions and opposite them, one style and stigma, and many or sometimes few ovules on a free central placenta of the one-celled ovary, in fruit a pod.

* *Plant with hollow, inflated, leafy stems; the leaves whorled or scattered, the lower ones pinnately parted; parts of the flower* 5.

1. HOTTONIA. Calyx 5-parted. Corolla short salver-shaped, stamens included. Pod opening by 5 clefts down the side, many-seeded. Flowers small, in whorls along the upper part of the stem and branches.

* * *Plant with leaves all from the root and simple; the flowers on a scape.*

+ *Fibrous-rooted or rhizomatous.*

2. PRIMULA. Calyx 5-toothed or 5-cleft, often angled. Corolla salver-shaped or funnel-shaped, with 5 spreading lobes; the stamens included in its tube. Pod opening by valves or teeth at the top. Flowers in an umbel, which is sessile in one species, but usually raised on a scape.

3. DODECATHEON. Calyx 5-parted, reflexed. Corolla 5-parted; the divisions lanceolate, strongly reflexed. Stamens conniving in a long slender cone, the linear anthers very much longer than the short partly monadelphous filaments. Pod splitting into 5 valves. Flowers in an umbel.

+ + *Plant with depressed or biscuit-shaped fleshy corm.*

4. CYCLAMEN. Flower resembling that of Dodecatheon, but only one on a scape or stalk. Anthers sessile, pointed.

* * * *Plant with leafy stems, the leaves simple and chiefly entire.*

+ *Leaves in one whorl at the summit of the slender stem; parts of the flower* 7.

5. TRIENTALIS. Calyx and corolla wheel-shaped, of mostly 7 divisions united only at base, those of the former linear-lanceolate, of the latter oblong, of both pointed. Filaments united in a ring at base; anthers oblong, curving when old. Flowers white.

+ + *Leaves generally in pairs or whorls along the stems; parts of the flower mostly* 5.

++ *Flowers yellow (or in* 7 *with purple dots).*

6. STEIRONEMA. Calyx 5-parted. Staminodia 5, subulate, alternating with the filaments, which are distinct or nearly so on a ring at the base of the corolla. Capsule 10–20-seeded. Leaves opposite, but often seeming to be whorled, not dotted.

7. LYSIMACHIA. Calyx 5–6-parted. Staminodia 0. Filaments usually united at the base. Capsule few–several-seeded. Leaves opposite or whorled (or even imperfectly alternate), dotted.

++ ++ *Corolla red, blue, or white.*

8. ANAGALLIS. Corolla wheel-shaped, the 5 divisions broad. Filaments bearded. Pod (a pyxis) open by a transverse division, the top falling off as a lid, many-seeded.

+ + + *Leaves alternate along the branching stems; base of calyx and ovary coherent.*

9. SAMOLUS. Calyx 5-cleft. Corolla bell-shaped, 5-cleft, with a little body like a sterile filament in the clefts. Stamens included. Pod many-seeded, splitting into 5 valves. Flowers small, white, in racemes.

1. HOTTÒNIA, WATER VIOLET or FEATHER-FOIL. (Named for *Prof. Hotton* of Holland.) Flowers summer. 2

H. inflàta, Ell. A singular plant in pools and ditches, Mass., S.; smooth, with stems and branches much inflated except at the joints, bearing finely cut pectinate leaves; flowers white.

2. **PRÍMULA**, PRIMROSE, COWSLIP, etc. (Name from *primus*, spring, from the flowering time of true Primrose.) ♃ Two small species are scarce along our northern borders (see Manual); the following are the common ones cult. for ornament.

* *Calyx large and loose, either much inflated or shallow-cup-shaped.*

P. Sinénsis, Sabine. CHINESE PRIMROSE. A downy plant, with often proliferous umbels of large and showy flowers, purple, rose, or white, sometimes double, in one variety cut-fringed; tender house plant, with inflated conical calyx, and round heart-shaped 7–9-lobed and variously cut or even crisped leaves.

P. obcónica, Hance. A pretty pot plant, with leaves all radical and ovate-cordate (the sharp hairs irritating-poisonous to some people), and slender scapes 6′–12′; flowers blush-lilac or purple, often drooping, the obconical petals deeply notched, the tube twice longer than the almost saucer-shaped green and shallow calyx. China.

* * *Calyx ordinary, neither truly inflated (but often loose) nor shallow-spreading.*

← *Hardy, or nearly so, from Eu., with large tubular or oblong-bell-shaped angled calyx about as long as the corolla tube, and wrinkled-veiny, oblong-cordate, or spatulate leaves tapering into short wing-margined petioles; flowers naturally yellow, in spring.*

P. grandiflòra, Lam. (or P. VULGÀRIS and P. ACAÙLIS). TRUE PRIMROSE, has leaves somewhat hairy beneath, and the large flowers rising on slender pedicels from their axils, the proper scapes not developed; corolla flat, sulphur-yellow.

P. officinàlis, Jacq. (or P. VÈRIS). ENGLISH COWSLIP. Somewhat pubescent with minute, pale down, scapes bearing the umbels above the leaves, much smaller flowers of deeper color, and the limb of corolla rather concave or cup-like, the throat commonly orange. The sorts of POLYANTHUS are cultivated varieties, with flowers enlarged, of various colors, or party-colored, often more or less double.

← ← *Hardy or half hardy, with small calyx shorter than the tube of the corolla, and smaller leaves.*

↔ *Leaves cordate-ovate, hairy.*

P. cortusoìdes, Linn. Leaves soft, with doubly dentate margins; scapes tall (8′–15′) and hairy, bearing an umbel of deep rose-colored flowers on slender pedicels 1′ or 2′ long, the flowers Phlox-like, with broadly obcordate petals. Russia to Japan.

↔ ↔ *Leaves oblong or obovate, not hairy.*

P. denticulàta, Smith. Low, with a cluster of radical tongue-shaped or spatulate denticulate or nearly entire leaves, and a capitate cluster of small, bright lilac flowers, the narrow petals deeply notched. China and India.

P. Aurícula, Linn. AURICULA. Of S. Eu.; low, with sessile leaves, and scape bearing a few fragrant flowers, these pale yellow, with varieties white, purple, or of various hues, sometimes full double, and smooth and thick obovate leaves, mostly covered with some fine mealiness; petals broad, obcordate. Well-known garden plant, scarcely hardy N.

3. **DODECÀTHEON.** (Fanciful name, from Greek for *twelve gods*.) ♃

D. Meàdia, Linn. SHOOTING STAR, AMERICAN COWSLIP. In rich open woods from Penn., S., and especially W., and cult. for ornament;

smooth, with a cluster of oblong or spatulate leaves around the base of a simple scape, 6′–2° high, which has an umbel of several or many handsome rose-purple or often white flowers nodding on the slender pedicels, becoming erect in fruit; flowers late spring.

4. CÝCLAMEN. (Classical name for the wild plant of Eu. called Sowbread.) Cult. in this country as house plants for winter flowering. Flowers rose-colored, pink, or white, nodding on the apex of the stalk, the reflexed lobes turned upwards. 2l

C. Europæum, Linn. Corm 1′–2′ in diameter, sending up heart-shaped, thick, sometimes angled leaves, often marked with white above and crimson-purple or violet beneath, on slender petioles, and fragrant flowers with open throat and oval or oblong divisions, the flower stalks coiled up after flowering so as to bring the pod to the ground to ripen.

C. latifòlium, Sibth. & Smith (or C. Pérsicum), is more tender and not fragrant, with longer and lanceolate divisions and less open throat to the corolla, the flower stalks not coiling after blossoming.

5. TRIENTÀLIS, CHICKWEED WINTERGREEN. (From Latin for the third part of a foot, the usual height of the European species.) 2l

T. Americàna, Pursh. American C. or Star Flower. In open low woods, especially N.; a pretty plant, the stem bearing a few scales below, and at top a whorl of long, lanceolate leaves tapering to both ends; also 2 or 3 slender-stalked delicate flowers with taper-pointed petals, in spring.

6. STEIRONÈMA. (Greek: *sterile thread*, in reference to the staminodia.) Leafy-stemmed, flowering in summer. 2l

* *Leaves broad, ovate, or lance-ovate.*

S. ciliàtum, Raf. Low thickets; with erect stems 2°–3° high, opposite dotless leaves lance-ovate with rounded or heart-shaped ciliate base and on fringed petioles, flowers nodding on slender peduncles from the upper axils, light-yellow corolla not streaked or dotted, the lobes round-ovate and wavy margined or denticulate, little longer than the sepals.

S. radìcans, Gray, resembles the foregoing, but stems or branches reclined and rooting, and leaves and flowers smaller by half. Va., S. W.

* * *Leaves lanceolate or narrower.*

S. lanceolàtum, Gray. Commonest W. and S., has oblong or linear leaves, mostly narrowed into short and margined petioles.

S. longifòlium, Gray. From W. N. Y., W. and S., has similar but deeper yellow flowers, and sessile linear blunt stem leaves of thicker texture.

7. LYSIMÀCHIA, LOOSESTRIFE (which the name means in Greek). Flowers summer. 2l Low grounds.

* *Plant erect.*

– *Flowers in an ample terminal leafy panicle; the corolla not dotted.*

L. vulgàris, Linn. A rather stout downy plant, 2°–3° high, with oblong or lance-ovate leaves, 3 or 4 in a whorl; flowers in panicles, and monadelphous filaments. European species in waste and cultivated grounds.

+ + Flowers in a terminal spike-like raceme; the corolla blackish streaked.

L. stricta, Ait. Common N. and S. in bogs; smooth, very leafy, branching, with mostly opposite lanceolate, sessile, dark-dotted leaves tapering to each end; flowers on slender pedicels in a terminal long raceme leafy at base, unequal filaments monadelphous, and lance-oblong corolla lobes.

+ + + Flowers on slender peduncles from the axils of the upper leaves; the corolla dark-streaked.

L. quadrifòlia, Linn. Sandy moist ground; rather hairy, with ovate-lanceolate sessile leaves, 4 (or 3–6) in a whorl, and ovate-oblong corolla lobes.

+ + + + Flowers in axillary spike-like short clusters; the corolla purplish-dotted.

L. thyrsiflòra, Linn. Wet swamps, N.; smooth, with simple stem, leafless at base, above with lanceolate sessile leaves, in the axils of 1 or 2 of them a short-peduncled oblong spike or cluster of small flowers, having slender filaments and lance-linear mostly separate petals, and as many little teeth between them.

** * Plant trailing.*

L. nummulària, Linn. Moneywort. Creeping in damp garden grounds, or running wild sometimes; smooth, with opposite small round leaves, and solitary pretty yellow flowers in their axils on short peduncles. (Lessons, Fig. 199.)

8. ANAGÁLLIS, PIMPERNEL. (Old Greek name, meaning *delightful*.) Low herbs of the Old World, flowering all summer.

A. arvénsis, Linn. Common P. or Poor Man's Weather Glass. The small (red, purple, or white) flowers said to close at the approach of rain; in gardens and running wild in sandy fields; spreading on the ground, with pale ovate leaves, shorter than the peduncles, and rounded petals fringed with minute glandular teeth. ①

A. cærùlea of the gardens is a tender, mostly larger form of the preceding, with larger blue flowers.

9. SÁMOLUS, WATER PIMPERNEL, BROOKWEED. (Old name, of unknown meaning.) Flowers late summer. ① 2ℓ

S. Valerándi, Linn., var. **Americànus**, Gray. Along rills and wet places; spreading, 6′–10′ high, with obovate leaves, and very small flowers on slender pedicels, which bear a bractlet at the middle, but no bract at base.

LXVIII. SAPOTACEÆ, SAPODILLA FAMILY.

Mainly tropical trees or shrubs, with hard wood. Simple and entire alternate leaves, mostly with milky juice, small and perfect regular flowers, anthers turned outwards, erect ovules, and bony-coated seeds. Represented S. by a few species of

1. BUMÈLIA. (Ancient name of an Ash.) Flowers small, white, or whitish, in clusters in the axils of the leaves; calyx 5-parted; corolla 5-cleft, and with a pair of internal appendages between the lobes, 5

good stamens before them, and as many petal-like sterile ones or scales alternating; ovary 5-celled, hairy; style 1, pointed; fruit cherry-like, containing a single, large, stony-coated seed; small trees or shrubs, with branches often spiny, and deciduous but thickish leaves, entire. Flowers summer; fruit purple or blackish. Natives of river banks, etc.

B. lycioìdes, Pers. Southern Buckthorn. Smooth, with obovate-oblong or lance-wedge-shaped leaves, 2′–4′ long, and greenish flowers. Va., S. and W.

B. tènax, Willd. Still more southern, has smaller leaves brown-silky underneath, and a shorter white corolla.

B. lanuginòsa, Pers. Dry soil from S. Illinois, S.; has leaves rusty-hairy or woolly beneath, and white corolla.

LXIX. EBENACEÆ, EBONY FAMILY.

Trees, with hard wood, no milky juice, alternate entire leaves, from 2 to 4 times as many stamens as there are lobes to the corolla, several-celled ovary, with a single ovule hanging in each cell, and edible berry with large, hard-coated seeds.

1. **DIOSPỲROS**, PERSIMMON, DATE PLUM. (Greek: *Jove's grain* or *fruit.*) Flowers polygamous or dicœcious, the fertile ones single in axils of leaves, the sterile smaller and often clustered; calyx and corolla each 4–6-lobed; stamens about 16 in the sterile, 8 imperfect ones in the fertile flowers, inserted on the tube of the corolla; anthers turned inwards; fruit edible when very ripe, plum-like, globular, surrounded at base by the persistent thickish calyx. Flowers early summer.

D. Virginiàna, Linn. Common P. S. N. Eng. to Ill. and S.; tree 20°–60° high, with very hard blackish wood; nearly smooth, thickish, ovate leaves; very short peduncles; 4-parted calyx; pale-yellow, 4-cleft corolla; 4 styles, 2-lobed at tip; 8-celled ovary, and plum-like fruit, green and very acerb, but yellow, sweet, and eatable after frost.

D. Kâki, Linn. f. Kaki, Japanese P. Tree reaching 40° in height, upright at first, but becoming spreading and crooked with age; leaves large, ovate-elliptic and acuminate, shining; flowers small, greenish-yellow; fruit mostly very large, variable in shape and color. The chief tree fruit of Japan, and now planted in the S. States.

LXX. STYRACACEÆ, STORAX FAMILY.

Shrubs or trees, with alternate simple leaves, perfect flowers with 4–8 petals more or less united at the base, and bearing twice as many or indefinitely numerous partly monadelphous or polyadelphous stamens, only one style, and a 1–5-celled 1–5-seeded fruit. Ovules as many as 2 in each cell. Calyx in ours coherent more or less with the 2–4-celled ovary.

1. STYRAX. Flowers from the axils of the leaves, white, showy, on drooping peduncles. Calyx scarcely 5-toothed, its base coherent merely with the base of the 3-celled many-ovuled ovary. Corolla open bell-shaped, mostly 5-parted, rather downy outside. Stamens twice as many as the lobes of the corolla, with flat filaments monadelphous at base, and linear anthers. Fruit dry, 1-celled, with usually only one globular hard-coated seed at its base.
2. HALESIA. Flowers in fascicles on hanging pedicels from the axils of the deciduous leaves of the preceding year, white, showy. Calyx 4-toothed, the tube wholly coherent with the 2–4-celled ovary. Petals 4, or united into a bell-shaped corolla. Stamens 8–16; filaments monadelphous at the base; anthers linear-oblong. Ovules 4 in each cell. Fruit large and dry, 2–4-winged, within bony or woody, and 1–4-celled, a single seed filling each slender cell.
3. SYMPLOCOS. Flowers yellow, in the axils of the thickish leaves, not drooping. Calyx 5-cleft, coherent with the lower part of the 3-celled ovary. Petals 5, broad, nearly separate. Stamens very many in 5 clusters, one attached to the base of each petal; filaments very slender; anthers very short. Fruit 1-celled, 1-seeded, small and dry.

1. STŸRAX, STORAX. (The ancient Greek name.) Leaves, etc., with some scurf or starry down. Shrubs, in low pine woods or barrens, from Va., S.; flowers late spring.

* *Leaves prominently scurfy or tomentose beneath.*

S. grandifòlia, Ait. Leaves obovate (2′–6′ long), white downy beneath; flowers mostly numerous in racemes.

S. pulverulénta, Michx. Leaves oval or obovate, less than 2′ long, their lower face scurfy-downy; flowers fragrant, few together or single.

* * *Leaves glabrous, or nearly so, beneath.*

S. Americàna, Lam. Leaves oblong, almost glabrous, acute at both ends; flowers 2–4 together or single.

S. Japónica, Sieb. & Zucc. Handsome small tree from Japan, now planted, with waxy white bell-like flowers in loose racemes 1–4-flowered, on the ends of the branches; leaves ovate to lance-ovate, very acute, at maturity perfectly glabrous.

2. HALÈSIA, SNOWDROP or SILVER-BELL TREE. (Named for *Stephan Hales*, early writer of essays in vegetable physiology.) Handsome tall shrubs or small trees, flowering in spring just as the leaves appear.

H. tetráptera, Linn. FOUR-WINGED H. Along streams from Va. and Ill., S., planted for ornament and hardy N.; tall, smoothish, with oblong, finely serrate leaves; 4-lobed corolla; 12–16 strongly monadelphous stamens, and 4-winged fruit.

H. díptera, Linn. TWO-WINGED H. Low country, Ga., S.; has coarsely serrate more downy oval leaves; 4 nearly distinct petals (1′ long); 8–12 nearly distinct stamens, and 2-winged fruit.

3. SŸMPLOCOS. (Greek: *growing together*, the stamens united.)

S. tinctòria, L'Her. SWEET LEAF, HORSE SUGAR. Shrub or small tree, in rich ground, Del., S., with coriaceous, oblong, nearly entire, almost evergreen leaves, pale beneath, and small odorous flowers in close sessile bracted clusters. Leaves sweet-tasted, greedily eaten by cattle.

LXXI. OLEACEÆ, OLIVE FAMILY.

Trees or shrubs, chiefly smooth, without milky juice, distinguished among monopetalous plants with free ovary by the regular flowers having stamens almost always 2, and always fewer than the 4 (sometimes 5 or more) divisions of the corolla, the ovary 2-celled and (except in Jasminum and Forsythia) with one pair of ovules in each cell; style, if any, only one, rarely 2-cleft. A few are nearly or quite polypetalous; others apetalous. Leaves opposite, simple, or pinnate.

* *Calyx and corolla with* 5–8 *lobes; a single erect ovule and seed in each cell.*

1. JASMINUM. Corolla salver-shaped, the lobes convolute in the bud. Stamens 2, included in the tube. Ovary and the berry-like fruit 2-lobed, 2-seeded.

* * *Calyx and corolla with the parts in fours, or sometimes* (in Fraxinus) *one or both wanting. Ovules hanging, usually a pair in each cell, many in No.* 2. *Leaves opposite, except accidentally.*

\+ *Leaves simple* (*trifoliolate in one of No.* 2); *flowers perfect and complete.*

\+\+ *Ovules and seeds numerous, or several in each cell of the ovary and pod.*

2. FORSYTHIA. Corolla golden yellow, bell-shaped, 4-lobed, the lobes convolute in the bud. The 2 stamens and style short. Pod ovate. Leaves deciduous.

\+\+ \+\+ *Ovules a pair in each cell, but the seeds often fewer.*

= *Fruit a dry pod.*

3. SYRINGA. Corolla salver-form, the lobes valvate in the bud, the tube mostly much longer than the 4-toothed calyx. Pod 4-seeded, flattened contrary to the narrow partition, 2-valved, the valves almost conduplicate. Seeds slightly wing-margined. Leaves deciduous.

= = *Fruit fleshy, berry-like.*

4. LIGUSTRUM. Corolla short funnel-form, with spreading ovate obtuse lobes, valvate in the bud, white. Fruit a 1–4-seeded black berry. Leaves firm and thickish, but deciduous.

5. OLEA. Corolla white, short, bell-shaped, or deeply cleft into 4 spreading lobes, which are valvate in the bud. Fruit a drupe, the hard stone often becoming 1-celled and 1-seeded. Leaves evergreen.

6. OSMANTHUS. Distinguished from Olea chiefly by the imbricated æstivation of the corolla. Flowers small, in axillary fascicles or racemes. Stigma small. Leaves mostly deciduous.

7. CHIONANTHUS. Corolla white, 4-parted, or of 4 very long and narrow linear petals slightly or scarcely united at their base; to which the 2 (rarely 3 or even 4 in cultivation) very short stamens barely adhere. Fruit a fleshy and globular drupe, the stone becoming 1-celled and commonly 1-seeded. Leaves deciduous.

\+ \+ *Leaves pinnate; flowers polygamous or dioecious, in most species apetalous, appearing in advance of the foliage.*

8. FRAXINUS. Calyx small, sometimes obsolete or wholly wanting. Petals 4, 2, or none. Anthers large. Fruit a simple samara or key (Lessons, Fig. 389), usually becoming 1-celled and 1-seeded. Leaves deciduous.

1. **JÁSMINUM**, JESSAMINE. (From the Arabic name.) Cultivated for ornament, from the Old World, all tender and house plants except at the South. Flowers fragrant.

* *Flowers yellow; leaves commonly alternate and compound.*

J. odoratíssimum, Linn. Common Sweet Yellow J., from Madeira; smooth, twining; leaflets 3 or 5, ovate; peduncles terminal, few-flowered.

J. hùmile, Linn. (or J. revolùtum), from S. Asia; not twining, has mostly 3–7 leaflets, and more numerous and fragrant flowers, 1½′ wide.

* * *Flowers yellow; leaves opposite, but usually falling before the flowers appear.*

J. nudiflòrum, Lindl. Branches green and angled; leaves small and ternate, falling in autumn, after which the yellow scentless flowers appear. China.

* * * *Flowers white; leaves opposite.*

J. officinàle, Linn. Common White J. From the East; has striate-angled branches scarcely twining, about 7 oblong or lance-ovate leaflets, a terminal cyme of very fragrant flowers, and calyx teeth slender.

J. grandiflòrum, Linn. From India; has 7 or 9 oval leaflets, the uppermost confluent, larger and fewer flowers than the foregoing, reddish outside.

J. Sámbac, Sol. From tropical India; scarcely climbing, pubescent; leaves simple, ovate, or heart-shaped; flowers in small close clusters; calyx teeth about 8, slender, the rounded lobes of the corolla as many; flowers simple or double, very fragrant, especially at evening.

2. **FORSÝTHIA**. (Named for *W. A. Forsyth*, an English botanist.) Ornamental shrubs, from China and Japan, with flowers from separate lateral buds, preceding the serrate leaves, in early spring.

F. viridíssima, Lindl. A vigorous shrub, with strong and mostly erect yellowish angled green branches, covered in early spring with abundant showy yellow flowers; calyx lobes half the length of the corolla tube; lobes of the corolla narrow-oblong and widely spreading; style as long as the tube of the corolla and twice as long as the stamens; leaves all simple, lance-oblong, deep green.

F. suspénsa, Vahl. (F. Fortùni). Shrub with long and slender, weak, nearly terete branches, some of them reclining; flowers yellow, with corolla lobes longer, wider, more obtuse, and more spreading than in the preceding; style half shorter than the corolla tube and stamens; leaves simple and trifoliolate, often on the same bush (if compound, the lateral leaflets small), broadly ovate. Branches bearing corky dot-like elevations. Often treated as a climber. Less common than the other.

3. **SYRÍNGA**, LILAC. (From Greek word for *tube*, alluding either to the tubular corolla or to the twigs, used for pipe-stems.) Familiar ornamental tall shrubs, from the Old World, with scaly buds in the axils of the leaves, but hardly ever a terminal one (so that there is only a pair at the tip of a branch), entire leaves on slender petioles, and crowded compound panicles or thyrsus of mostly fragrant flowers, in spring. The name Syringa is often applied to the Philadelphus (see p. 168).

* *Tube of the corolla long and slender; flowers normally purple, but running into white varieties.*

+– *Leaves green on both sides.*

++ *Base of leaves broad, cordate or deltoid.*

S. vulgàris, Linn. COMMON L. Common bush, with ovate and more or less heart-shaped leaves, and lobes of corolla moderately spreading and concave or boat-shaped; flowers lilac or pale-violet (and a white variety), appearing after the leaves. Nurserymen offer many forms. E. Eu.

S. oblàta, Lindl. Stout hardy shrub, with thick leaves, flowering a week or more before the last; leaves broadly cordate or deltoid, sharply acuminate; flower cluster short and broad, the flowers large and appearing as the leaves unfold; lobes of the corolla round and flat. China, but unknown wild; possibly an offshoot of the preceding.

++ ++ *Base of the leaves narrower or tapering.*

S. Chinénsis, Willd. (S. ROTHOMAGÉNSIS). ROUEN L. Apparently a hybrid between the first and the next; cult. in China, whence it may have been derived; leaves ovate, contracted at the base (or occasionally rounded); lobes of the corolla obtuse and sometimes mucronate, spreading, the margins inflexed; lax clusters of reddish (or white) flowers very large and numerous. A hardy and showy plant.

S. Pérsica, Linn. PERSIAN L. Slender and open in habit, with lance-ovate leaves, and loose clusters of lilac-purple, or paler, or sometimes white flowers, border of the corolla with ovate slightly spreading inflexed lobes, the tube very slender; pods linear. Later than the common Lilac. W. Asia.

+– +– *Leaves whitish beneath.*

S. villòsa, Vahl. Vigorous and hardy; leaves broadly ovate or ovate-lanceolate, contracted into a short and stout grooved petiole, with rough margins and prominent veins, the underside (especially the veins) furnished with scattering long hairs; thyrse long and often interrupted; tube of the pale corolla 4 times the length of the calyx; corolla lobes erect or spreading, with inflexed margins. Blooms two weeks later than the common Lilac, but less fragrant. N. China.

S. Josikæa, Jacq. JOSIKA L. Leaves mostly narrower than in the last, and not villous below. Now commonly cult. for its vigorous growth, handsome shining foliage, and late lilac flowers, but unknown wild (all plants in cultivation having sprung from a plant discovered in Hungary by Baroness von Josika), and perhaps derived from the last.

* * *Tube of the corolla very short; flowers white.*

S. Amurénsis, Rupr. (S. LIGUSTRÌNA and S. PEKINÉNSIS). Hardy shrub, with leaves ovate or oblong, and either obtuse or acuminate, contracted into a long grooved petiole, pale but smooth beneath; thyrse compact; tube of the corolla included in the smooth calyx, the lobes obtuse; fragrant. Also a weeping variety. Mandshuria and Japan.

S. Japónica, Maxim. Leaves broadly ovate and sharply acuminate, dark green and glossy, leathery, rounded or slightly cuneate at the base, villous beneath; calyx slightly pubescent, including the tube of the creamy-white corolla. Flowers very late. Japan.

4. **LIGÚSTRUM**, PRIVET or PRIM. (Classical Latin name.) Shrubs of Old World, planted for ornament, with short-petioled entire leaves and panicles of small flowers, in early summer.

* *Inflorescence spiciform on the ends of lateral branchlets; calyx hairy.*

L. Ibòta, Sieb. (L. AMURÉNSE). Japan and China. Flowers white, slender, the tube three times as long as the calyx; leaves elliptic or

ovate-elliptic, the midrib below (like the branchlets and pedicels) hairy; fruit shining black.

* * *Inflorescence thyrsoid or paniculate and mostly terminal; calyx smooth, or nearly so.*

L. vulgàre, Linn. PRIVET, PRIM. Flowers white (fading reddish) in an ordinary Lilac-like thyrse; the corolla tube flaring and about twice as long as the small calyx; leaves elliptic-lanceolate; fruit black. Much used for low hedges and run wild E. Eu.

L. Japónicum, Thunb. (L. CALIFÓRNICUM, L. OVALIFÒLIUM, and CALIFORNIAN PRIVET). Strong hardy shrub from Japan and China; cult. for its handsome long-persistent foliage and abundant white flowers; leaves oval; flowers several to many on slender short branchlets of an elongated panicle; the corolla tube slender and 3 or 4 times as long as the rather loose truncate calyx.

5. ÒLEA, OLIVE. (The classical Latin name.) Flowers small, and in small panicles or corymbs, in spring.

O. Europœa, Linn. OLIVE of the Levant, planted far S. and on the Pacific coast; tree with lanceolate or lance-oblong pale entire leaves, whitish-scurfy beneath, and oblong edible oily fruit.

6. OSMÁNTHUS. (Greek: *perfume* and *flower*.)

O. frágrans, Lour. Cult. in greenhouses from China, under the name of OLEA FRAGRANS; shrub with very fragrant white flowers, and thickish ovate or obovate veiny, often denticulate, smooth leaves.

O. Americànus, Benth. & Hook. DEVILWOOD. Wild along the coast from N. Car., S.; small tree, with lance-oblong and entire very smooth green leaves (3′–6′ long), and spherical dark-purple fruit.

7. CHIONÁNTHUS, FRINGE TREE. (Name of the Greek words for *snow* and *blossom*, from the very light and loose panicles of drooping snow-white flowers.)

C. Virgínica, Linn. River banks from Penn., S., and planted for ornament; shrub or low tree, with entire, oval, or obovate leaves (3′–5′ long), the lower surface often rather downy; loose panicles of flowers in late spring or early summer; petals 1′ long, and fruit blue-purple with a bloom.

8. FRÁXINUS, ASH. (Classical Latin name.) Timber trees, with light and tough wood, dark-colored buds, and small insignificant flowers appearing in spring with or rather before the leaves of the season, from separate buds in the axils of the leaves of the preceding year.

* *Petals present; flowers polygamous.*

F. Órnus, Linn. FLOWERING ASH of S. Eu., the tree which furnishes *manna*, not hardy N., sometimes planted S.; petals 4, either distinct or slightly united, or sometimes only 2, narrow, greenish; leaflets 5–9, lanceolate or oblong, small.

* * *Petals wanting; flowers generally diœcious (or polygamous in the last).*

← *Lateral leaflets stalked; calyx evident.*

†† *Fruit terete at the base, winged from the other end* (Lessons, Fig. 389); *leaflets 7–9, or sometimes 5, either sparingly toothed or entire.*

F. Americàna, Linn. WHITE ASH. Large forest tree of low grounds, furnishing valuable timber; with ash-gray branches, smooth stalks, ovate

or lance-oblong pointed leaflets, either pale or downy beneath; and rather short fruit with a terete marginless body and a lanceolate or wedge-linear wing.

F. pubéscens, Lam. Red Ash. Common E. and S.; known by its velvety-pubescent young shoots and leafstalks, and fruit with its flattish 2-edged seed-bearing body acute at the base, the edges gradually dilated into the lance-linear or oblanceolate wing.

F. víridis, Michx. Green Ash. Glabrous throughout, with leaves bright green on both sides; fruit much as in the last; a small tree, most common W. and S.

++ ++ *Fruit flat and winged all round; leaflets mostly green both sides and serrate.*

F. quadrangulàta, Michx. Blue Ash. Large forest tree W., yielding valuable wood; with square branchlets, 5–9 ovate veiny leaflets on short stalks, and narrowly oblong fruits.

F. platycárpa, Michx. Carolina Water Ash. River swamps, Va., S.; small tree, with terete branchlets, 5–7 ovate or oblong short-stalked leaflets acute at both ends, and broadly winged (sometimes 3-winged) fruits, oblong with a tapering base.

+ + *Lateral leaflets sessile; calyx absent; fruit winged all round.*

F. sambucifòlia, Lam. Black Ash. Small tree in swamps N., S. to Va. and Mo., with tough wood separable in layers, used for hoops and coarse baskets; the bruised leaves with the scent of Elder; smooth; leaflets 7–11, sessile on the main stalk, oblong-lanceolate tapering to a point; calyx none, at least in the fertile flowers; fruits linear-oblong.

F. excélsior, Linn. English or European Ash. Hardy fine tree, with bright green, lance-oblong, serrate leaflets; fruit flat, linear-oblong. The Weeping Ash is a variety or sport of this.

LXXII. APOCYNACEÆ, DOGBANE FAMILY.

Herbaceous or woody plants, known mainly by the milky acrid juice, opposite (sometimes whorled) simple and entire leaves, without stipules, and regular monopetalous flowers with 5's in the calyx, corolla, and stamens, the lobes of the corolla convolute or twisted in the bud, the anthers conniving around the stigma or often adhering somewhat to it, ordinary pollen, filaments separate, the 2 free ovaries commonly separate, but often the styles and always the stigmas, united into one. The ovaries also are often united into one, the juice in several (as of Periwinkle and Oleander) is not at all or slightly milky, and one of our genera has alternate leaves. Some are ornamental in cultivation; many are acrid poisonous. There is commonly a ring, membrane, or other appendage on the style below the stigma, to which the anthers are apt to adhere.

* *Shrubs cult. for ornament, natives of warm climates; leaves often whorled.*

1. **ALLAMANDA.** Corolla large, yellow, with short tube abruptly expanded into cylindrical bell-shaped or funnel-form, the 5 lobes broad and rounded. Stamens at the summit

of the proper tube or throat, alternate and conniving with as many 2-parted narrow scales. Ovary one and 1-celled, with 2 parietal placentæ, becoming a prickly pod. Style slender. Seeds naked.

2. NERIUM. Corolla salver-form or the long tube narrow funnel-form, the throat crowned with 5 slender-toothed scales. Stamens on the middle of the tube; anthers 2-tailed at base and tapering at the apex into a long hairy, twisted, awn-like appendage. Style 1. Ovaries 2, forming pods. Seeds tufted.

* * *Herbs or scarcely woody plants, not twiners; bark usually abounding with tough fibers; ovaries* 2, *becoming many-seeded pods in fruit.*

+ *Leaves alternate, very numerous.*

3. AMSONIA. Corolla salver-shaped or the slender tube somewhat funnel-form, bearded inside, without appendages at the throat, the lobes long and linear. Stamens inserted on and included in the tube; anthers blunt at both ends. Style 1, slender. Pods long (4'–6') and slender. Seeds cylindrical, abrupt at both ends, with no tuft. Upright herbs, with terminal panicled cymes of bluish flowers.

+ + *Leaves opposite.*

4. VINCA. Corolla salver-shaped, or the tube funnel-form, the throat narrow and naked. Stamens inserted on the upper part or middle of the tube; filaments short. Style 1, slender. Pods rather short. Seeds abrupt at each end, naked, rough. The hardy species trail or creep.

5. APOCYNUM. Corolla bell-shaped, crowned with 5 triangular appendages in the throat. Stamens attached to the very base of the corolla. Style none. A large ovate stigma unites the tips of the 2 ovaries, which in fruit form long and slender pods. Seeds with a long tuft of silky down at one end. Upright or ascending herbs, with small pale or white flowers in terminal cymes or corymbs, and very tough fibrous bark.

* * * *More or less woody-stemmed twiners, with opposite leaves.*

6. MANDEVILLA. Corolla funnel-form or salver-shaped, naked in the throat. Filaments very short. Style 1. Ovaries 2, becoming 2 long terete pods. Seeds with a downy tuft. Flowers large and showy.

7. TRACHELOSPERMUM. Corolla funnel-form, nearly as in Mandevilla, but the flower small, and filaments slender.

1. ALLAMÁNDA. (Named for *Dr. F. Allemand*, who discovered the common species in Guiana.) Greenhouses, often half-climbing.

* *Corolla tube contracted below into a long stem-like base.*

A. cathártica, Linn. A showy shrub of the conservatory, with bright green, oblong, thinnish and acute glabrous leaves on very short petioles and in whorls of 4, and golden-yellow flowers 2½'–3' long. Guiana.

A. nóbilis, Moore. Flowers very large (4'–5' across) and rich, clear yellow, the limb circular in outline; leaves in 3's or 4's, large and abruptly acuminate, on very short petioles, hairy on both sides or at least on the midrib beneath. Brazil.

A. Hendersòni, Bull. Flowers large and pale yellow, with darker veins; leaves large, elliptic-obovate, shining and glabrous, thick and leathery, in 4's. Guiana.

A. Schóttii, Pohl. Flowers large and yellow, the throat striped with dark brown; leaves oblong and glabrous, in 4's. Tall, suited to roofs. Brazil.

* * *Corolla with a short club-shaped or bulb-like base.*

A. neriifòlia, Hook. Erect, glabrous shrub, with oblong or elliptic sharply acuminate, nearly sessile leaves, in 3's–5's; flowers rather small, funnel-bell-shaped, golden-yellow, and streaked with orange. S. Amer.

2. NÈRIUM, OLEANDER. (The ancient Greek and Latin name.) Leaves coriaceous, rigid, closely and transversely veiny. Flowers showy, in terminal cymes, in summer, deep rose-color, or with white varieties, either single or double.

N. Oleánder, Linn. The OLEANDER of common house culture, from the Levant; leaves lanceolate; appendage surmounting the anthers scarcely protruding; flowers large, scentless, with trifid or cuspidate segments to the crown.

N. odòrum, Soland. SWEET O. Less cult., from India, more tender; leaves linear-lanceolate; appendage of the anthers protruding; flowers fragrant, with multifid crown segments.

3. AMSÒNIA. (Named for *Mr. Charles Amson.*) Low grounds chiefly S.; very leafy, 2°–3° high, smooth or somewhat hairy, with rather small flowers, in late spring. 2ℓ

A. Tabernæmontàna, Walt. Leaves varying from ovate or lance-ovate to lanceolate, acute at each end, pale beneath. Ind. and Ill., S.

A. angustifòlia, Michx. Leaves linear or linear-lanceolate, the margins and mostly the stems beset with some scattered bristles. N. C., S.

4. VÍNCA, PERIWINKLE. (Latin name, of obscure meaning.) 2ℓ

§ 1. TRUE PERIWINKLES, *cult. from Europe, hardy or nearly so, smooth, trailing over the ground or creeping, only the short-flowering stems ascending, with blue (or by variation white) flowers solitary in the axils, in spring or early summer.*

V. mìnor, Linn. COMMON PERIWINKLE. In all country gardens, and running wild in cemeteries and shady places; spreading freely by the creeping sterile stems, evergreen, with ovate or oblong-ovate shining leaves, barely 1½′ long, and almost truncate wedge-shaped lobes to the corolla; flowers early spring. Many horticultural varieties, some with variegated foliage. Sometimes, but erroneously, called MYRTLE.

V. màjor, Linn. Not quite hardy N., a variety with variegated leaves much cultivated in greenhouses; larger than the first species and leaves cordate-ovate and (like the calyx) ciliate; lobes of corolla obovate.

V. herbàcea, Wald. & Kit. Less evergreen than the first; stems reclining and rooting; leaves lance-oblong, revolute; lobes of the more purple-blue corolla oblong-obovate; flowers late spring.

§ 2. *Tropical erect, somewhat woody at base; flowers produced all the season.*

V. ròsea, Linn. House and bedding plant from West Indies, and also growing in S. Fla., where it is possibly native; leaves oblong-petioled, veiny; showy corolla with slender tube and very narrow orifice, rose-purple, or white, with or without a pink eye.

5. APÓCYNUM, DOGBANE (to which the name in Greek refers), INDIAN HEMP, from the use made of the bark. Flowers summer. 2ℓ

A. androsæmifòlium, Linn. Along thickets, mostly N.; branches forking and widely spreading; leaves ovate, petioled; corolla open, bell-shaped, with revolute lobes, the tube much longer than the ovate calyx lobes.

A. cannábinum, Linn. COMMON INDIAN HEMP. Gravelly or wet banks of streams; branches more erect; leaves oblong, lance-oblong, ovate, or slightly heart-shaped; flowers more crowded and erect; lobes of the corolla little spreading, the tube about the length of the lanceolate calyx lobes.

6. MANDEVÍLLA. (*H. J. Mandeville*, British minister at Buenos Ayres.) Plants from the warm parts of America, one not rare as a conservatory climber.

M. suavèolens, Lindl. (ECHÌTES SUAVÈOLENS.) CHILE JESSAMINE. Slender, woody-stemmed, tall twiner, with thin, oblong or ovate heart-shaped, pointed, opposite leaves, and slender peduncles bearing a few racemed very fragrant flowers, the white corolla with ample 5-lobed border, 2′ broad.

7. TRACHELOSPÉRMUM. (Greek: *neck, seed.*) 2*l*

T. diffórme, Gray. Low grounds from Va. S. and W., is a barely woody twiner, the flowering branches herbaceous and downy; leaves thin, oval-lanceolate, pointed, or sometimes linear, narrowed into a petiole; flowers ¼′ long, in cymes, greenish-yellow, all summer.

T. (or RHYNCHOSPÉRMUM) *jasminoìdes*, Lem. Handsome greenhouse climber from China; leaves thick, ovate, acute and entire and often revolute; flowers white and very fragrant, in a straggling cyme or panicle.

LXXIII. ASCLEPIADACEÆ, MILKWEED FAMILY.

Plants with milky juice, leaves, pistils, fruits, and seeds nearly as in the preceding family; but the anthers more connected with the stigma, their pollen collected into firm waxy or granular masses (mostly 10), the short filaments (monadelphous except in the last genus) commonly bearing curious appendages behind the anthers, forming what is called a crown, and the corolla more commonly valvate in the bud. The flowers are rather too difficult for the beginner readily to understand throughout. For a particular study of them the Manual must be used.

§ 1. *Erect herbs, with ordinary foliage, and deeply 5-parted calyx and corolla. Flowers in simple umbels. Fruit a pair of pods (follicles) containing numerous flat seeds furnished with a coma* (Lessons, Fig. 417) *or long tuft of soft down at one end.*

1. ASCLEPIAS. Corolla reflexed. Stamens with their short filaments monadelphous in a ring or tube, bearing behind each anther a curious erect and hood-like or ear-like appendage, with a horn projecting out of the inside of it; the 5 broad anthers closely surrounding and partly adhering to the very thick stigma, a membranous appendage at their tip inflected over it. Each of the 2 cells of the anther has a firm waxy pear-shaped pollen mass in it; and the two adjacent masses from two contiguous anthers are suspended by a stalk from a dark gland; these 5 glands, borne on the margin of the flat top of the stigma, stick to the legs of insects, and are carried off, each gland taking with it 2 pollen masses, the whole somewhat resembling a pair of saddle bags. Leaves mostly opposite.
2. ASCLEPIODORA. Differs from Asclepias in having the lobes of the corolla ascending or spreading, and the hoods without horns and widely spreading and somewhat incurved and slipper-shaped, the cavity divided at the apex by a crest-like partition. Leaves alternate.
3. ACERATES. Like Asclepias, but no horn or crest in the hoods or ear-like appendages, and the flowers always greenish. Leaves generally alternate.

§ 2 *Twining or half-scandent plants with ordinary foliage; pods and seeds nearly as in Asclepias.*

* *Anthers with their hanging pollen masses nearly as Asclepias; pods smooth and even.*

4. ENSLENIA. Calyx and corolla 5-parted, the divisions lance-ovate and nearly erect. The 5 appendages of the filaments are in the form of membranaceous leaflets, each bearing a pair of awns on their truncate tip. Herb.

5. VINCETOXICUM. Corolla 5-parted, wheel-shaped. A flat and fleshy 5-10-lobed disk or crown in place of the hoods of Asclepias. Herbs.

6. CYNANCHUM. Differs from the above chiefly in having 5 scales or ligules in the sinuses of the crown.

* * *The 10 pollen masses horizontal, fixed in pairs to 5 glands of the stigma.*

7. GONOLOBUS. Corolla wheel-shaped; a fleshy and wavy-lobed ring or crown in its throat.

* * * *The 10 short pollen masses fixed by their base in pairs to the 5 glands of the stigma, and erect. Shrubby plants, of tropical regions.*

8. HOYA. Corolla wheel-shaped, 5-lobed, thick and wax-like in appearance. Crown of 5 thick and depressed fleshy appendages radiating from the central column.

9. STEPHANOTIS. Corolla salver-shaped, the tube including the stamens, crown, etc., in its somewhat swollen base, the 5 ovate lobes convolute in the bud. Crown of 5 thin erect appendages. Stigma conical.

* * * * *Anthers distinct, the 5 pollen masses each composed of 4 small granular masses united, and applied directly to the glands of the stigma without any stalk. Shrubby twiners.*

10. PERIPLOCA. Corolla 5-parted, wheel-shaped, the divisions hairy on the upper face; alternate with them are the 5 small, thick scales, each bearing a bristle-shaped appendage. Filaments distinct, bearing anthers of more ordinary appearance than in the rest of this family. Stigma hemispherical. Pods smooth.

§ 3. *Fleshy low plants, Cactus-like, with only small fleshy scales or teeth in place of leaves, on the angles of the thickened stems or branches.*

11. STAPELIA. Flowers large, lurid, solitary, lateral. Calyx 5-parted. Corolla 5-cleft, wheel-shaped; within is a crown formed of two rings of short appendages or lobes. Masses of waxy pollen 10, erect.

1. ASCLÈPIAS, MILKWEED, SILKWEED. (The Greek name of *Æsculapias*, father of medicine.) Flowering in summer. 2

* *Flowers bright orange or red; pods naked.*

+– *Leaves irregularly alternate.*

A. tuberòsa, Linn. BUTTERFLY WEED, PLEURISY ROOT. Dry hills; milky juice hardly any; stems and mostly scattered linear or lance-oblong leaves hairy; flowers bright orange.

+– +– *Leaves opposite.*

A. Curassávica, Linn. Wild far S., and sparingly cult. from S. Amer., as a house and bedding plant; nearly smooth; leaves lanceolate; umbels long-peduncled; corolla scarlet-red, the hoods orange.

A. paupércula, Michx. Wet barrens from N. J., S.; tall, smooth, with long lance-linear leaves, one or more few-flowered umbels raised on long peduncle, and red corolla with bright orange hoods.

A. rùbra, Linn. Smooth, with lance-ovate, gradually taper-pointed leaves, a few many-flowered umbels on a long naked peduncle, and purple-red flowers. Low barrens from N. J., S.

* * *Flowers pink or light rose-purple; leaves all opposite; pods naked.*

A. incarnàta, Linn. Wet grounds; very leafy, branching stems, lanceolate or lance-oblong acute leaves, often slightly heart-shaped at the base; smooth or smoothish, or in var. **púlchra**, pubescent and the leaves very short-petioled.

* * * *Flowers dull purplish, greenish, or white.*

– *Stems branching, almost woody at base; leaves all opposite; pods naked.*

A. perénnis, Walt. Nearly smooth; leaves lanceolate or lance-ovate, slender-petioled; flowers small, white; seeds mostly without a tuft. S. Ind. and S.

– – *Stems simple; leaves all opposite and closely sessile or clasping by a heart-shaped base, the apex rounded or notched; plants smooth, pale or glaucous; pods naked.*

A. obtusifòlia, Michx. 2°–3° high, the rather remote, broadly oblong leaves wavy; umbel mostly solitary, long-peduncled; flowers pretty large, greenish-purplish. Sandy soils.

A. amplexicaùlis, Michx. Dry barrens N. Car., S.; stems reclining, 1°–2° high, very leafy; leaves ovate-heart-shaped; umbels several, short-peduncled; corolla ash-colored, the hoods white.

– – – *Stems simple or nearly so, leafy to the top; leaves all opposite, ovate, oval, or oblong, pretty large, short-petioled; umbels lateral and terminal; flowers ½′ long or nearly so.*

– – *Pods beset with soft prickle-shaped or warty projections.*

A. Cornùti, Decaisne. Common Milkweed of fields and low grounds N.; downy, or the large pale leaves soon smooth above; flowers dull greenish-purplish.

– – *Pods even, but usually minutely downy.*

A. phytolaccoìdes, Pursh. Poke Milkweed. Moist grounds N. and W., S. to Ga.; smooth or smoothish, 3°–5° high; leaves large, pointed or acute at both ends; umbels loose, the long pedicels (1′–3′) equaling the peduncle; corolla greenish, but the more conspicuous hoods white.

A. purpuráscens, Linn. 1°–3° high, leaves downy beneath, smooth above, the upper taper-pointed; pedicels of the rather loose umbel shorter than the peduncle; corolla dark dull purple. Dry ground, N. Eng. W. and S.

A. variegàta, Linn. 1°–2° high, nearly smooth; leaves oval or obovate, slightly wavy; peduncle and crowded pedicels short and downy; corolla white, the hoods purplish. Dry woods, N. Y., W. and S.

– – – – *Stems simple or rarely branched, slender; most of the leaves in whorls; pods slender and naked; flowers small, white or whitish.*

A. quadrifòlia, Linn. Stems 1°–2° high, nearly smooth, naked below, bearing about the middle one or two whorls of 4 ovate or lance-ovate taper-pointed petioled leaves, and beneath or above them usually a pair of smaller ones; pedicels slender; corolla mostly tinged with pink, the hoods white. Woods and hills, N. Eng., W. and S.

A. verticillàta, Linn. Dry ground; 1°–2° high, smoothish; stems very leafy throughout; leaves very narrow, linear or thread-shaped, in whorls of 3–6; flowers greenish-white.

2. ASCLEPIODÒRA. (Name made from Asclepias.) 2l

A. víridis, Gray. Smoothish, 1° high; leaves alternate, oblong or lance-oblong; flowers 1′ broad, green, the hoods purplish, in loose ter-

minal and solitary or corymbed umbels; pods thick, often with some soft tubercle-like projections. Prairies, Ill. to Tex. and S. C.

3. ACERÀTES, GREEN MILKWEED. (Name from the Greek, means *without a horn*, i.e. none to the hood-like appendages, in which it differs from Asclepias.) Flowers green or greenish, in summer. 2l

A. viridiflòra, Ell. Dry sandy or gravelly soil; soft-downy or smoothish, 1°–2° high; leaves varying from oval to linear, mostly opposite; globular umbels nearly sessile; flowers short-pediceled, nearly ½′ long when open; hoods not elevated above the base of the corolla.

A. longifòlia, Ell. Low barrens Ohio, W. and S.; rather hairy or roughish, 1°–3° high, with very numerous, mostly alternate, linear leaves; flowers smaller and on slender pedicels, the umbel peduncled; hoods elevated on a short ring of filaments above the base of the corolla.

4. ENSLÉNIA. (Named for *A. Enslen*, an Austrian traveler.) 2l

E. álbida, Nutt. Climbing, 8°–12°; smooth, with opposite, heart-ovate, long-petioled leaves, and small, whitish flowers, in raceme-like clusters on axillary peduncles, all late summer. River banks, Penn., S. and W.

5. VINCETÓXICUM. (Latin: *binding, poison.*) 2l

V. nìgrum, Moench. A low-twining, smooth weed from Eu., escaping from gardens E.; leaves ovate and lance-ovate; flowers small, brown-purple, rather few in axillary umbels, in summer.

6. CYNÁNCHUM. (Greek, meaning *dog poison.*)

C. acuminatifòlium, Hemsley (or VINCETÓXICUM ACUMINÀTUM). MOSQUITO PLANT, so called, because small insects are stuck fast in the clefts of the crown; flowers white and pretty, in axillary clusters; leaves lanceolate or ovate-lanceolate and acuminate; 2°–3°, with a twining tendency. Japan. 2l

7. GONÓLOBUS. (Greek: *angled pod.*) Ours are twining herbs, along river banks, with opposite, heart-shaped, petioled leaves, and corymbs or umbels of dark or dull-colored small flowers, on peduncles between the petioles. The following are the commonest. 2l

G. lævis, Michx. Smooth or only sparingly hairy, the yellowish-green flowers and the longitudinally ribbed pods smooth. Va., S. and W.

G. obliquus, R. Br. Hairy, somewhat clammy; flowers minutely downy outside, long and narrow in the bud, dull crimson-purple within, the strap-shaped or lanceolate divisions ½′ long; pods ribless, warty. Penn., S. and W.

G. hirsùtus, Michx. Differs from the last in its short-ovate flower buds, the oval or oblong divisions of corolla only about ¼′ long. Va., S. and W.

8. HÓYA, WAX PLANT. (*Thomas Hoy*, an English gardener.) 2l

H. carnòsa, R. Br. Well-known house plant from India; with rooting stems, thick and fleshy oval leaves, umbels of numerous flesh-colored or almost white flowers, the upper surface of corolla clothed with minute papillæ.

9. STEPHANÒTIS. (Greek: *crown* and *ear*, referring to the appendages of the stamens.) 2l

S. floribúnda, Brong. MADAGASCAR JASMINE. A fine hothouse twiner, very smooth, with opposite, oval or oblong, thickish leaves, and lateral

umbels of very showy fragrant flowers, the pure white corolla $1\frac{1}{2}'$ in diameter, the tube 1′ long, and egg-shaped, naked fruit. Madagascar.

10. PERÍPLOCA. (A Greek name, implying that the plant twines.) 2

P. Grœca, Linn. S. Eu., cult. as an ornamental twiner, hardy through the Middle States; smooth, with opposite ovate, mostly pointed leaves, on short petioles, and lateral cymes of rather small flowers, the corolla greenish-yellow, with the upper face of the oblong lobes brownish-purple; in summer.

11. STAPÈLIA. (Named for a Dutch naturalist, *Dr. Van Stapel.*) Strange-looking, fleshy plants of the Cape of Good Hope, cult. in conservatories along with Cactuses. Many species are cult.; one of the commonest is

S. hirsùta, Linn. Stems or branches 6′–10′ high, with concave sides, pale and obscurely downy; flower 3′–4′ in diameter, dull purple and yellowish, with darker transverse stripes, beset with purple, very long hairs, and with denser hairiness towards the center, exhaling a most disgusting odor, not unlike that of putrid meat.

LXXIV. LOGANIACEÆ, LOGANIA FAMILY.

Known among monopetalous plants by having opposite leaves with stipules or a stipular line between their bases, along with a free ovary; the 4–5-merous flower regular or nearly so, the stamens as many as the lobes of the corolla and alternate with them, and the ovary free from the calyx. Herbs, shrubs, or trees, often united to Rubiaceæ.

* *Woody twining climber, with evergreen leaves and showy flowers.*

1. GELSEMIUM. Calyx 5-parted. Corolla open funnel form, the 5 lobes broad and imbricated in the bud. Stamens 5; anthers sagittate. Style slender; stigmas 2, each 2-parted, lobes linear; ovary 2-celled. Pod oval, flattened contrary to the partition, 2-valved, many-seeded. Seeds winged.

* * *Herbs, not climbing.*

2. SPIGELIA. Calyx 5-parted, the lobes narrow. Corolla tubular and somewhat funnel form, the 5 lobes valvate in the bud. Stamens 5; anthers linear. Style 1, slender, hairy above, jointed near the middle. Pod short, twin, 2-celled, few-seeded, when ripe separating across near the base which is left behind, and splitting into 2 or 4 valves.

MITREOLA, of the South, comprises two inconspicuous weeds, and

POLYPREMUM, also S., is a common weedy plant; — both wholly insignificant, as well in the herbage as in the minute white flowers.

1. GELSÉMIUM, YELLOW JESSAMINE of the South, the name an Italian one for Jessamine, but of a different order from true Jessamine.

G. sempérvirens, Ait. Climbing on trees, bearing shining, lance-ovate, small leaves (evergreen far S.), and a profusion of axillary clusters of bright yellow, very fragrant, handsome flowers (1′ or more long), in early spring. Va., S.

2. SPIGÈLIA, PINKROOT, WORM GRASS. (Named for *Adrian Spiegel*, Latinized *Spigelius*.) Flowers summer. ♃

S. Marilándica, Linn. Rich woods, from N. J., W. and S.; nearly smooth, 6′–18′ high; leaves sessile, lance-ovate, acute; flowers in simple or forked spike-like clusters, terminating the stem or branches; corolla 1½′ long, slender, handsome, red outside, yellow within, the lobes lanceolate. Root used as a vermifuge.

LXXV. GENTIANACEÆ, GENTIAN FAMILY.

Known generally from the other monopetalous plants with free ovary by the 1-celled ovary and pod with 2 parietal placentæ covered with small seeds, along with regular flowers, having stamens as many as the lobes of the corolla and alternate with them, and the leaves opposite, simple, entire, and sessile, without stipules. The exceptions are that in some cases the ovules cover the whole inner face of the ovary, and in one group the leaves are alternate and even compound. They are nearly all very smooth and bitter-tonic plants, with colorless juice, the calyx persistent. Ours herbs, none in common cultivation.

* *Leaves opposite or whorled and entire, sessile. Corolla with the lobes mostly convolute in the bud, sometimes also plaited in the sinuses.*

\+ *Style slender, deciduous from the pod; anthers soon curving.*

1. SABBATIA. Calyx 5–12-parted, the divisions slender. Corolla wheel-shaped, 5–12-parted. Style 2-parted. Pod globular, many-seeded. Slender herbs.

\+ \+ *Stout style (if any) and stigmas persistent on the pod; anthers remaining straight.*

\++ *Corolla lobes mostly bearing an appendage or a plait in the sinus.*

2. FRASERA. Calyx and corolla deeply 4-parted, wheel-shaped; divisions of the latter with a glandular and fringed spot or pit on their middle. Pod oval, flattened, rather few-seeded; seeds large and flat, wing-margined. Large thick-rooted herbs, with whorled leaves and panicled flowers.

3. GENTIANA. Calyx 4–5-cleft. Corolla 4–5-lobed, often with teeth or salient folds at the sinuses, usually withering persistent. Style short or none; stigmas 2, persistent. Pod oblong, containing innumerable small seeds with loose cellular or winged coat. Flowers solitary or clustered, mostly showy.

\++ \++ *No appendages.*

4. BARTONIA. Calyx 4-parted. Corolla deeply 4-cleft. Style none. Pod oblong, flattish, the minute innumerable seeds covering its whole inner face. Flowers very small. Leaves reduced to little awl-shaped scales.

5. OBOLARIA. Calyx of 2 leafy sepals. Corolla persistent after withering, 4-cleft, the lobes imbricated in the bud. Style short and persistent, the stigma 2-lipped. Stamens short, inserted at the sinuses of the corolla. Low half-fleshy herbs with wedge-obovate opposite small leaves.

* * *Leaves alternate, long petioled. Corolla with the lobes valvate and the edges turned inwards in the bud. Seeds many or few, with a hard or bony coat.*

6. MENYANTHES. Calyx 5-parted. Corolla very short funnel form, 5-lobed, white-bearded over the whole upper face. Style slender, persistent; stigma 2-lobed. Pod

globular, with many smooth and shining seeds. Flowers racemed on a stout scape; one or more long petioles sheathing its base, and bearing 3 oval or oblong leaflets.

7. LIMNANTHEMUM. Calyx and corolla 5-parted; the oval divisions of the latter with a yellowish crest at their base, and in our species otherwise naked. Style short or none. Pod several-seeded. Water-plants, bearing the flowers in an umbel on the long slender petiole of the floating, round-heart-shaped leaves.

1. **SABBÀTIA**, AMERICAN CENTAURY. (*L. Sabbati*, an Italian botanist.) Chiefly in sandy and low or wet grounds, along the coast (with one or two exceptions); flowers white or pink, usually handsome, in summer. ① ②

* *Flowers white, 5-parted, numerous in cymes or corymbs, seldom over ½′ broad.*

S. paniculàta, Pursh. Stem 1°–2° high, with 4 sharp wing-like angles; leaves linear or oblong, mostly 1-nerved; lobes of the corolla little longer than the narrow-linear calyx lobes. Va., S.

S. lanceolàta. Torr. & Gray. Taller, larger-flowered, with lance-ovate, 3-nerved leaves, or the upper ones lanceolate and distant, acute; lobes of corolla much exceeding the thread-shaped calyx lobes. N. J., S.

S. macrophýlla, Hook. Glaucous, with terete stem, 2°–3° high; lance-ovate 3–5 nerved leaves thickish, and lobes of smaller corolla very much exceeding the bristle-like calyx lobes. Ga., S.

* * *Flowers rose-pink, rarely white, with yellowish or greenish eye, 5-parted, in panicled clusters, 1′ or more broad. In rather dry ground, much branched above, 1°–3° high.*

S. brachiàta, Ell. Stem slightly angled; leaves linear or narrow-oblong; flowers few, only 1′ broad. Ind., W. and S.

S. angulàris, Pursh. Wing-like angles to the stem, ovate or heart-shaped, 5-nerved leaves, and corolla 1½′ broad. Ontario, W. and S.

* * * *Flowers rose-purple or white, 5–6-parted, 1′ or less broad, scattered singly on long peduncles; stems slender, 5′–20′ high, commonly forking, scarcely angled. All grow in salt marshes or near the coast.*

S. calycòsa, Pursh. Leaves oblong, pale, narrowed at base; calyx lobes lance-spatulate, longer than the mostly white corolla. Va., S.

S. stellàris, Pursh. Has lance-oblong leaves or the upper linear, and linear calyx lobes shorter than the rose-purple yellowish eyed corolla. Mass., S.

S. grácilis, Salisb. Very slender, with linear or almost thread-like leaves, thread-shaped calyx lobes as long as corolla; otherwise like preceding. Mass., S.

* * * * *Flowers bright rose-color or with white varieties, 7–12-parted, very handsome, 1½′–2′ broad; stems simple or sparingly branched, 1°–2° high.*

S. chloroìdes, Pursh. Along sandy ponds, from Mass., S.; leaves lanceolate; peduncles 1-flowered, slender; calyx lobes linear.

S. gentianoìdes, Ell. Stem leaves linear; flowers short-peduncled or sessile, clustered. Wet barrens, Ga., S.

2. **FRÀSERA**, AMERICAN CALUMBA. (*John Fraser*, who collected in this country a century ago.)

F. Carolinénsis, Walt. Rich wooded ground N. Y. to Wis., and S.; root very large and deep, bitter (used in medicine as a substitute for

Calumba); stem 3°–8° high; leaves mostly in fours, lance-oblong, or the lowest spatulate; corolla 1′ wide, greenish-yellow or whitish, and dark-dotted. ② 2ℓ

3. **GENTIÀNA**, GENTIAN. (Old name, from *Gentius*, king of Illyria.) Chiefly in woods and damp ground; flowering chiefly in autumn, a few in summer.

* *Corolla without plaits at the sinuses; anthers separate; seeds wingless.* ①

+ *Corolla lobes fringed or erose.*

G. crinìta, Froel. FRINGED GENTIAN. Leaves lanceolate or broader, with rounded or heart-shaped base; flowers solitary on long peduncles terminating the stem or simple branches; calyx with 4 unequal lobes; corolla sky-blue, showy, 2′ long, funnel form, the 4 wedge-obovate lobes with margins cut into a long and delicate fringe. N. Eng., W. and S.

G. serràta, Gunner. Has linear leaves and less fringe to the corolla, often none at the top of the lobes. N. Y., W.

+ + *Corolla lobes entire.*

G. quinqueflòra, Lam. Branching; leaves ovate-lanceolate or slightly heart-shaped at base; flowers panicled, hardly 1′ long, the 5 lobes of the pale blue corolla triangular-ovate, bristle-pointed. Me., S. and W., in several varieties.

* * *Corolla naked, 1½′–2′ long, with plaits at the sinuses, which project more or less into teeth or thin intermediate lobes; pod stalked in the corolla.* 2ℓ

+ *Stems 1°–2° high, bearing clustered or rarely solitary 2-bracted flowers at the summit of the leafy stem, and often in the upper axils also.*

++ *Corolla between bell-shaped and short funnel form or obconical, mostly open, with ovate lobes exceeding the usually toothed appendages of the plaits.*

= *Leaves and calyx lobes ciliate or rough-margined.*

G. Saponària, Linn. SOAPWORT G. Low woods, chiefly N. and along the Alleghanies; leaves lance-ovate, oblong, or obovate, narrowed at base; calyx lobes linear or spatulate; corolla light blue or verging to white, little open, its short and broad lobes longer than the conspicuous 2-cleft intermediate appendages; anthers conniving or united; seeds narrowly-winged.

G. pubérula, Michx. Dry barrens and prairies N. Y., W. and S.; low, roughish, or minutely pubescent, with lance-oblong, ovate, or linear rough-margined leaves only 1′–2′ long; calyx lobes lanceolate; corolla bright blue, open, its spreading ovate lobes 2 or 3 times longer than the cut-toothed intermediate appendages; seeds not covering the walls of the pod, as they do in the related species.

= = *Leaves and calyx lobes smooth or very nearly so.*

G. álba, Muhl. Leaves lance-ovate from a partly heart-shaped base, tapering thence to a point; calyx lobes ovate, short; corolla yellowish-white, with short and broad lobes; anthers conniving; seeds broadly winged. Ontario, W. and S., flowering at midsummer.

G. lineàris, Froel. Grows from Md., N., in several forms; stem slender and strict, 1°–2°; leaves linear or narrow-lanceolate, somewhat narrowed at the base; calyx lobes linear or lanceolate; flowers blue, narrow, 1–5 in a terminal cluster, the roundish lobes little longer than the acute appendages; seeds winged. Bracts sometimes finely scabrous.

G. ochroleùca, Froel. Leaves obovate or spatulate-oblong, narrowed at the base; calyx lobes linear; corolla greenish-white, with greener and purplish stripes inside, somewhat bell-shaped; anthers separate; seeds wingless. Penn., S.

++ ++ *Corolla more club-shaped and seldom open, truncate, with no proper lobes.*

G. Andréwsii, Griseb. CLOSED G. Leaves lance-ovate or lance-oblong, with a narrowed base; calyx lobes ovate or oblong, short; corolla blue (rarely a white variety), its proper lobes if any shorter than the broad and more conspicuous fringe-toothed and notched appendages, which terminate the folds; anthers connected; seeds broadly winged. N. Eng., N. and S.

+ + *Stems low, bearing* 1–3 *slender-peduncled flowers; seeds wingless.*

G. angustifòlia, Michx. Pine barrens from N. J., S.; 6′–15′ high, with linear leaves, and open funnel-form azure-blue corolla 2′ long, its lobes ovate; anthers separate.

4. BARTÒNIA. (Named for *Prof. B. S. Barton*, of Philadelphia.) Insignificant herbs, with awl-shaped scales for leaves, and a few peduncled white flowers. ① ②

B. tenélla, Muhl. 5′–10′ high, with branches or peduncles 1–3-flowered; lobes of corolla oblong, acutish; ovary 4-angled; flowers summer. N. Eng., W. and S.

B. vérna, Muhl. Smaller, less branched, 1–few-flowered; flowers larger, in early spring; lobes of corolla spatulate, obtuse; ovary flat. Va., S.

5. OBOLÀRIA. (Named for a Greek coin, in allusion to the thick rounded leaves.) ♃

O. Virgínica, Linn. Smooth and purplish, rather fleshy plant, 3′–8′, with a nearly or quite simple stem, and dull white or purplish flowers either solitary or in clusters of 3. N. J., W. and S.

6. MENYÁNTHES, BUCK BEAN. (Greek: *month* and *flower*; application not obvious. The popular name from the leaves, somewhat resembling those of the Horsebean.)

M. trifoliàta, Linn. Cold wet bogs N.; flowers late spring; corolla white or tinged with pink, pretty; scape hardly 1° high. ♃

7. LIMNÁNTHEMUM, FLOATING HEART. (Greek for *swamp* and *blossom*.) Our species grow in water, and produce through the summer the small white flowers, accompanied by spur-like, thick bodies, probably of the nature of roots. ♃

L. lacunòsum, Griseb. Common E. and S.; leaves 1′–2′ long, on very slender petioles, entire; lobes of corolla broadly oval; seeds smooth and even.

L. trachyspérmum, Gray. In deeper water, from Md. S.; leaves rounder, 2′–6′ broad, wavy-margined, roughish or dark-pitted beneath; petioles stouter; seeds roughened.

LXXVI. POLEMONIACEÆ, POLEMONIUM or PHLOX FAMILY.

Ours mostly herbs, with regular flowers, persistent 5-cleft calyx, the 5 lobes of the monopetalous corolla convolute in the bud, 3-lobed style, 3-celled ovary and pod; the single, few, or many seeds in each cell borne on the thick axis. Embryo straight in the axis of albumen. Insipid and innocent plants, the juice watery. Nearly all are N. American plants, many cult. for ornament.

* *Erect or diffuse herbs, not climbing, and with nothing resembling stipules.*

\+ *Stamens unequally inserted on the tube of the corolla.*

1. PHLOX. Calyx narrow, prismatic or plaited, 5-toothed or 5-cleft. Corolla salver-shaped, with a long tube (Lessons, Fig. 255), in which the 5 short and unequally inserted stamens are included. Ovary often with 2 ovules, but the short pod with only one seed in each cell. Leaves entire and mostly sessile, the lower all opposite, upper often alternate.

\+ \+ *Stamens equally inserted in the corolla.*

2. LŒSELIA. Corolla tubular or funnel form, more or less irregular from the limb being unequally cleft. Filaments naked and declined.
3. GILIA. Calyx tubular or bell-shaped, 5-cleft. Corolla of various shapes. Stamens equally inserted and projecting from the throat of the corolla, not declined, generally naked. Ovules and seeds several in each cell. Leaves either entire, cut, or divided.
4. POLEMONIUM. Calyx bell-shaped. Corolla open-bell-shaped or short funnel form. Stamens slender, like those of Gilia, but declined, hairy-appendaged at the base. Leaves pinnate, alternate.

* * *Tall-climbing by compound tendrils on the pinnate leaves; lowest leaflets close to the stem, unlike the others, imitating stipules.*

5. COBÆA. Calyx of 5 large leaf-like divisions, the margins of which, applied each to each, appear like 5 winged angles. Corolla bell-shaped, with short and broad spreading lobes. Stamens declined. A fleshy disk around the base of the ovary. Seeds numerous in each cell of the pod, winged. Peduncles axillary, 1-flowered, leafy-bracted near the base, naked above. Leaves alternate.

1. PHLÓX. (Greek for *flame*, anciently applied to Lychnis, and transferred to these North American plants.)

* ♃ *Wild in mostly dry or rocky ground, some common in gardens.*

\+ *Stems erect; flowers in oblong or pyramidal panicle, with short peduncles and pedicels; lobes of corolla entire, pink-purple, and with white varieties; leaves flat, not subulate (mostly rather broad). Wild from Penn., S. and W.; flowers summer.*

P. paniculàta, Linn. Generally roughish or soft hairy, 2°–4° high, stout; leaves oblong or ovate-lanceolate, and mostly with tapering base; panicle broad; calyx teeth sharp-pointed. The commonest perennial phlox of the gardens, cult. in many named varieties. Often known as P. DECUSSÀTA.

P. maculàta, Linn. Very smooth; stem slender, 1°–2° high, purple-spotted; lower leaves narrower, and thickish, lanceolate, upper lance-ovate

from a rounded or somewhat heart-shaped base; panicle long and narrow, leafy below; calyx teeth less pointed. Cult., and perhaps hybridized with the preceding, but less frequent in gardens.

+ + *Stems ascending or erect, but often with a prostrate base, 1°–3° high; whole plant smooth, not clammy or glandular; flowers corymbed; lobes of corolla round and entire.*

P. ovàta, Linn. (or P. Carolìna). Leaves varying from lanceolate to ovate, or the upper heart-shaped; flowers crowded, short-peduncled, pink; calyx teeth acute. Penn. to Ala.

P. glabérrima, Linn. Slender; leaves often linear-lanceolate, 3′–4′ long; flowers fewer and loose, pink or whitish; calyx teeth sharp-pointed. Va., N. W. and S.

+ + + *Flowering stems ascending, or in the first erect, low, terminated by a loose corymb, which is clammy-pubescent more or less, as well as the thinnish leaves; flowers mostly pediceled; calyx teeth very slender; flowers late spring.*

P. pilòsa, Linn. Mostly hairy; stems erect 1° or so high; leaves lanceolate or linear, and tapering to a point (1′–2½′ long); flowers loose, with spreading, awn-pointed calyx teeth; lobes of pink, rose, or rarely white corolla obovate and entire. N. J., W. and S.; variable.

P. amœna, Sims. Pubescent, spreading from the base, 6′–1° high; leaves lanceolate, or broadly oblong or ovate on sterile shoots, short; flowers in a crowded, leafy-bracted corymb, with straight, hardly awn-pointed calyx teeth; corolla purple, pink, or nearly white. Barrens, Va. and Ky., S.

P. divaricàta, Linn. Moist woods from N. Y., W. and S.; soft-pubescent; stems loosely spreading; leaves ovate-oblong or broad-lanceolate (1′–2′ long); flowers loosely corymbed and peduncled; corolla large, pale lilac, bluish, or lead-colored, the lobes wedge-obovate or commonly inversely heart-shaped and as long as the tube. Sometimes called Wild Sweet William.

P. réptans, Michx. Spreading by long runners, which bear round-obovate, often smoothish leaves, those of the low flowering stems oblong or ovate (about ½′ long); flowers few but crowded; lobes of the deep pink-purple corolla round-obovate, large (1′ broad). Penn. and Ky., S.

+ + + + *Stems all diffuse and branching (but not creeping), rising 3′–6′; flowers peduncled and scattered or in small loose clusters.*

P. bífida, Beck. Minutely pubescent; leaves 1′–2′ long and linear, nearly glabrous; corolla violet-purple, the lobes 2- or 3-cleft to or below the middle, the divisions nearly linear and diverging. Prairies, Ill., Mo. Cult.

+ + + + + *Stems creeping and tufted, rising little above the ground, almost woody, persistent, as are the rigid and crowded glandular-pubescent leaves; flowers few in the depressed clusters, in early spring.*

P. subulàta, Linn. Ground or Moss Pink. Wild on rocky hills W. and S. of N. Eng., and common in gardens, forming broad mats; leaves awl-shaped or lanceolate, at most ½′ long; corolla pink-purple, rose with a darker eye, or varying to white, the wedge-obovate lobes generally notched at the end. Variable.

* * ① *Cultivated for ornament from Texas; flowers all summer.*

P. Drummóndii, Hook. From this come all the annual phloxes of the gardens; rather low, branching and spreading, somewhat clammy-pubescent, with corymbs of purple, crimson, rose-colored, buff and white, showy flowers. There are forms with fringed corollas.

2. LŒSÉLIA. (*John Lœsel* was author of a flora of Prussia.) ♃

L. coccínea, Don. A Mexican shrub, cult. in greenhouses for its long-funnel-form scarlet flowers, which are solitary and sessile, but nearly spicate; calyx lobes awl-pointed and many times shorter than the corolla; leaves oval or ovate, pale, rugose and hairy below, very sharply toothed, short-stalked; stems hairy.

3. GÍLIA. (*Philip Gil*, a Spanish botanist.) Species abound from Texas and Kansas to California. Several are choice annuals of the gardens; flowers summer.

* *Leaves either opposite or palmately divided to the base, or commonly both.*

G. liniflòra, Benth. (Erroneously called G. LINIFÒLIA.) Diffuse and spurrey-like, the divisions of the leaves nearly filiform; flowers loosely paniculate, on slender pedicels, white or tinted, $\frac{3}{4}'$ across, nearly rotate. Cal. Cult. for borders. ①

G. androsàcea, Steud. (or LEPTOSÌPHON ANDROSÀCEUS). Low and slender, with leaves palmately cleft into 5–7 narrow linear divisions, a head-like cluster of flowers, with very long and slender but small salver-shaped corolla, lilac or whitish with a dark eye. Cal. ①

* * *Leaves (save occasionally the lowermost) alternate, mostly pinnately cleft.*

+ *Flowers elongated, red.*

G. coronopifòlia, Pers. (or IPOMÓPSIS). STANDING CYPRESS, from the foliage resembling that of Cypress Vine; has erect, wand-like stem, 2°–3° high, thickly clothed with alternate, crowded leaves, pinnately divided into thread-like leaflets, and very long and narrow, strict, leafy panicle of showy flowers; the corolla tubular-funnel-form, light scarlet with whitish specks on the lobes inside, $1\frac{1}{2}'$ long. Sandy soil, S. Car., S. and W., and cult. ② (Lessons, Fig. 249.)

+ + *Flowers short, blue, or blue and white.* ①

G. achilleæfòlia, Benth. Pubescent, with flowers in a loose head; calyx woolly, the lobes with short recurved tips; corolla violet-blue or darker, with obovate or broadly oblong divisions. Cal.

G. capitàta, Dougl. Glabrous or very nearly so (as also the calyx); 1°–2° high, with alternate leaves twice pinnately divided into small, linear, or thread-like leaflets or lobes, and numerous small blue flowers crowded in heads at the end of naked branches; the corolla narrow funnel-form, with lanceolate lobes. Cal. and Ore.

G. tricolor, Benth. Stems branching, about 1° high; scattered, alternate leaves 2–3 times pinnately dissected into short linear divisions; flowers panicled at the end of the branches; corolla short funnel-form with lilac-purple or whitish lobes, brown-purple throat, and yellow tube; leaves and calyx somewhat viscid-pubescent. Cal. Common in gardens.

4. POLEMÒNIUM, GREEK VÁLERIAN. (From the Greek word for *war*, of no application.) Flowers early summer. ♃

P. réptans, Linn. Woods of Middle States, also cult.; smooth, with weak and spreading (but never creeping) stems 6′–10′ long, 7–11 lance-ovate or oblong leaflets, small corymbs of nodding light blue flowers, and stamens and style not longer than the corolla.

P. cærùleum, Linn. JACOB'S LADDER. Cult. in gardens from Eu., also rarely wild N.; smooth or sometimes hairy; with erect stem 1°–3°

high, 9–21 mostly lanceolate and crowded leaflets, clusters of bright blue flowers collected in a long panicle, and stamens and style longer than the lobes of the corolla, which is 1′ broad.

5. **COBÆA.** (Named for *B. Cobo*, a Spanish priest in Mexico, from which country the common species was introduced into cultivation.) 2*l*

C. scándens, Cav. Smooth, tall-climbing by its much-branching tendrils; leaflets ovate; dull purple or greenish corolla 2′ or more long, long filaments coiling spirally when old; flowers all summer; usually cult. as an annual.

LXXVII. HYDROPHYLLACEÆ, WATERLEAF FAMILY.

Plants resembling the foregoing family, in the arrangement of the flowers more commonly imitating the Borage Family; differing from both in the 1-celled ovary and pod with 2 parietal placentæ. In some, the placentæ unite in the axis, making a 2-celled ovary. Style 2-cleft or else 2 separate styles. Ovules at least 2 to each placenta. Seeds with a small embryo in hard albumen. Juice inert and watery. Leaves mostly alternate, simple or compound.

* *Style* 2-*cleft; ovary and pod* 1-*celled, with two parietal placentæ.*

\+ *Placentæ fleshy and so broad that they line the ovary, and inclose the (mostly* 4*) ovules and seeds; corolla usually convolute in the bud, commonly with* 5 *or* 10 *folds, scales, or other appendages down the inside of the tube.*

1. HYDROPHYLLUM. Calyx 5-parted, sometimes with small appendages at the sinuses, not enlarged in fruit. Corolla bell-shaped. Style and mostly hairy filaments protruded; anthers linear. Pod small, globose, ripening 1–4 spherical seeds. Flowers in crowded cymes or clusters. Leaves alternate, slender-petioled.
2. NEMOPHILA. Calyx 5-parted, and with a reflexed appendage in each sinus, somewhat enlarging in fruit. Corolla open bell-shaped or wheel-shaped, longer than the stamens. Flowers solitary and long-peduncled. Leaves mostly opposite, at least the lower ones.
3. ELLISIA. Calyx 5-parted, with no appendages. Corolla cylindrical or bell-shaped, not exceeding the calyx, the tube with 5 minute appendages within. Stamens included. Lower leaves opposite.

\+ \+ *Placentæ narrow, adherent directly to the walls, or else borne on an incomplete partition and projecting into the cell, where they sometimes meet; lobes of the corolla imbricated in the bud.*

4. PHACELIA. Calyx 5-parted, the divisions narrow; no appendages at the sinuses. Corolla open bell-shaped, approaching wheel-shaped, or in Whitlavia tubular-bell-shaped or slightly contracted at the throat, and the 5 short and broad lobes abruptly and widely spreading. Stamens and style often protruded. Pod 4–many-seeded. Leaves alternate. Flowers in one-sided raceme-like clusters or spikes.

* * *Styles* 2 (*rarely* 3), *separate quite to the base; ovary and pod* 2-*celled; seeds minute and very numerous.*

5. HYDROLEA. Calyx 5-parted. Corolla open-bell-shaped or approaching wheel-shaped, rather shorter than the stamens; filaments enlarged at base. Capsule bursting irregularly, or 2–4-valved. Herbs, or somewhat shrubby, with entire leaves and often spines in their axils. Flowers in loose axillary clusters.

6. WIGANDIA. Calyx lobes 5 linear. Corolla open-bell-shaped, the stamens generally exserted. Capsule 2-valved. Stout plants, with very large rounded leaves and sharp or stinging bristles.

1. HYDROPHÝLLUM. WATERLEAF is a translation of the name from the Greek, the application obscure. Plants of rich woods, etc. Flowers white or bluish-tinged, in early summer, often showy, but of short duration. ♃

* *Calyx with minute appendages if any; rootstocks creeping, scaly-toothed.*

H. macrophýllum, Nutt. From Ohio, W. and S.W.; rough-hairy, with leaves pinnately divided into 9–13 cut-toothed divisions or leaflets; a globular cluster of flowers on a very long peduncle.

H. Virgínicum, Linn. Smooth or smoothish, with 4–7 main divisions to the pinnate leaves, the lowest pair 2-parted, and calyx lobes bristly-ciliate. Rich woods, Canada S.

H. Canadénse, Linn. Barely 1° high, nearly smooth, the roundish leaves palmately 5–7-lobed and with heart-shaped base, or some minute leaflets on the petioles, which are longer than the peduncles of the flower cluster. N. Eng., W. and S.

* * *Calyx with a conspicuous reflexed appendage in each sinus.*

H. appendiculàtum, Michx. Pubescent or hairy, with rounded palmately 5-lobed leaves or some of them pinnately divided, rather loose flower-clusters, and bristly-hairy calyx; pedicels lengthening. Ontario, W. and S.

2. NEMÓPHILA. (Greek: *lover of the grove.*) Low spreading plants, mostly cultivated for ornament; flowers summer. ①

* *Seeds 5 or more; leaves mainly opposite, and shorter than the peduncles.*

N. maculàta, Benth. Prostrate, with leaves all opposite and mostly sessile, the lower lyrate-pinnatifid, upper sparingly cut-toothed, and white corolla with violet patch on each lobe. Cal.

N. insígnis, Dougl. Slender, procumbent, with lobes of the pinnate leaves cut-toothed, and pure blue corolla 1′ broad. Cal.

N. Menzièsii, Hook. & Arn. (N. ATOMÀRIA). Procumbent; leaves opposite, pinnatifid; corolla smaller, white sprinkled with chocolate-brown spots. Cal. and Ore.

* * *Seeds 4 or less; upper leaves alternate.*

N. phacelioìdes, Nutt. Wild from Ark. S., and sparingly cult.; with ascending stems 1°–2° long, alternate leaves pinnately parted into 3–9 oblong entire divisions, and purplish-blue corolla 1½′ broad.

N. micròcalyx, Fisch. & Mey. Roughish pubescent, the spreading stems 2′–8′ long; leaves parted into 3–5 roundish or wedge-obovate cut-lobed divisions; peduncles shorter than the petioles and opposite them; corolla white, exceeding the calyx. Va., S.

3. ELLÍSIA. (*John Ellis*, an English naturalist, correspondent of Linnæus.) ①

E. Nyctèlea, Linn. A roughish-hairy plant, 6′–12′, wild from N. J., to Minn., and S.; leaves pinnately parted into 7–13 narrow divisions; peduncles solitary in the forks or opposite the leaves; corolla whitish, about the length of the lanceolate calyx lobes.

4. PHACÈLIA. (Greek: *a cluster.*) Several species cult. for ornament.; flowers spring or summer.

§ 1. True Phacelia, *with only* 4 *ovules and seeds, lobes of corolla entire.*

P. congésta, Hook. Cult. from Texas; rather pubescent, with leaves pinnately divided or cleft into few oblong or ovate cut-toothed leaflets or lobes, and small blue flowers in 3 or 4 spikes at the summit of a slender peduncle; stamens slightly protruding. ①

P. tenacetifòlia, Benth. California; taller, bristly-hairy, with narrower pinnatifid leaflets, larger flowers in longer dense spikes and long stamens. ①

P. bipinnatìfida, Michx. 1°–2° high, branched, glandular-hairy, with leaves twice pinnately divided into ovate cut-lobed leaflets; flowers slender-pediceled in long loose racemes; violet-blue corolla, ½′ or more broad. Rich soil, Ohio and Ill., S. ②

§ 2. Cosmánthus; 4 *ovules and seeds, and fringed lobes to corolla.* ① ②

P. Púrshii, Buckley. Shady soil from Penn., W. and S., and cult. under the name of the next; slender, 8′–12′ high; lobes of pinnatifid leaves several, lance-oblong acute; flowers of the raceme numerous, on slender pedicels; corolla light blue or whitish, ½′ broad; filaments hairy.

P. fimbriàta, Michx. The true plant grows only in the high Alleghanies S., is smaller, with 3–7 rounded or oblong blunt divisions to the leaves, few and smaller white flowers.

§ 3. Whitlàvia, *with mostly numerous ovules; the corolla not fringed, the appendages reduced to* 5 *small scales.*

P. Whitlàvia, Gray (or Whitlàvia grandiflòra). Cult. for ornament, from Cal.; resembles Phacelia viscida in growth and foliage, but only slightly clammy, the roundish-ovate or slightly heart-shaped leaves coarsely toothed, on longer petioles; racemes loose; corolla 1′ or more long, violet-blue (also a white variety); stamens and style very slender and protruding.

§ 4. Cosmanthoìdes, *with seeds or at least ovules* 2–8 *on each placenta; corolla lobes entire, the appendages wanting or obscure.*

P. parviflòra, Pursh. Shaded banks from Penn. to N. Car. S. W.; scarce, delicate little plant, 3′–6′ high, with pinnately divided or cleft leaves, a raceme of few flowers on slender pedicels, bluish corolla less than ½′ wide, and few seeds. ②

§ 5. Eùtoca, *with ovules several or many, and appendages wanting or represented by vertical plaits.*

P. víscida, Torr. Cult. from California as Eùtoca víscida; clammy all over, with dark glandular hairs, rather coarse; leaves ovate, cut-toothed, short-petioled; racemes single, terminating the branches; corolla deep blue, 1′ or less wide; pod many-seeded. ①

P. Menzièsii, Torr. Handsome plant from Cal., cult. as Eùtoca Menzièsii and E. multiflòra; 3′–12′, much branched, roughish or hispid; leaves generally sessile, linear or lanceolate and entire, or some of them cleft; flowers violet or white, in loose panicles.

5. HYDRÒLEA. (Named from Greek word for *water;* the plants aquatic or in wet places.) Flowers summer. ♃

H. Caroliniàna, Michx. N. Car., S.; has hairy stems, lanceolate acute leaves tapering to the base, and lanceolate sepals nearly as long as the corolla.

H. affìnis, Gray. Smooth, with short-petioled lanceolate leaves, and ovate sepals as long as the corolla. S. Ill., S.

6. **WIGÁNDIA.** (*John Wigand*, a bishop of Pomerania.) Rank hispid greenhouse herbs, sometimes used in the open for tropical effects. Trop. Amer.

W. macrophýlla, Schlecht. & Cham. Leaves ovate-cordate, hairy-tomentose, rusty above, rather obtuse, toothed; flowers lilac in a terminal panicle with alternate branches; capsule densely hairy-canescent. 10°.

W. úrens, Choisy. Of looser habit, the leaves somewhat acute and longer-petioled, white-tomentose beneath, the petioles shaded with red; flowers violet, in one-sided scirpoid spikes; capsule hispid. 6°.

LXXVIII. BORRAGINACEÆ, BORAGE FAMILY.

Mostly rough or rough-hairy plants, known from all related monopetalous orders by having a deeply 4-lobed ovary, or apparently 4 ovaries around the base of a common style, each 1-ovuled, ripening into akenes or nutlets, along with regular flowers (Echium excepted), stamens as many as the lobes of the corolla (5) and alternate with them, and alternate (mostly entire) leaves. In the Heliotrope tribe, however, the ovary is not lobed, but the fruit at maturity separates into 2 or 4 nutlets. Stigmas 1 or 2. Embryo filling the seed; no albumen. Flowers disposed to be on one side of the stem or branches, or of the branches of cymes, the raceme-like clusters coiled at the end and straightening as the flowers expand. Herbage not aromatic; juice commonly bitterish, often somewhat mucilaginous. Roots of several are red and used for dye.

I. Ovary not divided, but tipped with the simple style, the fruit when ripe separating into 2 or 4 closed pieces or nutlets.

1. HELIOTROPIUM. Corolla short funnel-form or salver-shaped, the open throat (constricted in one species) more or less plaited. Anthers nearly sessile, included. Style short; stigma conical or capitate. Ovary 4-celled, in fruit splitting into 4 nutlets, or into 2 two-celled nutlets. Flowers small, in one-sided single or cymose-clustered spikes, mostly bractless.

II. Ovary deeply 4-parted, the style arising from the center between them. Ours are all herbs.

* *Corolla and stamens regular.*

÷ *Nutlets variously spiny or armed when mature.*

2. CYNOGLOSSUM. Corolla between short funnel-form and wheel-shaped, the tube about the length of the rounded lobes; throat closed by the blunt scales. Nutlets bur-like, oblique on the expanded base of the style, to which they are fixed by their apex, roughened all over with short barbed or hooked prickles. Coarse and strong-scented plants, with racemed flowers, the lower sometimes bracted, otherwise bractless.

3. ECHINOSPERMUM. Corolla with tube as short as the rounded lobes, the throat closed with short rounded scales. Nutlets erect, fixed to the central column or base

of the style, triangular, roughened, and bearing one or more marginal rows of barb-tipped prickles, forming small burs. Coarse weeds, with leafy-bracted racemed flowers.

+ + Nutlets unarmed (sometimes slightly roughened).

++ Corolla wheel-shaped, with no tube at all.

4. BORAGO. Flowers, as in the six following, perfectly regular. A blunt scale at the base of each lobe of the 5-parted corolla, alternating with the conniving stamens. Filaments very short, broad, and with a cartilaginous projection behind the linear pointed anther. Nutlets erect.

(8. MYOSOTIS, and 9. OMPHALODES, from the short tube to the corolla, may be sought for here.)

++ ++ Corolla tubular, funnel-form, or salver-shaped, sometimes almost wheel-shaped.

= Throat of corolla open, the folds or short scales, if any, not closing over the orifice.

‖ Fruit fleshy, smooth or wrinkled.

5. MERTENSIA. Corolla tubular, trumpet-shaped, with the widely spreading border scarcely at all lobed and its throat perfectly naked in the common species; the slender filaments protruding. Smooth plants, which is rare in this order.

‖ ‖ Fruit (or nutlets) hard, often stone-like.

6. ONOSMODIUM. Corolla tubular, with the 5 acute lobes erect or converging, the throat perfectly naked, bearing the arrow-shaped or linear and mucronate anthers; filaments hardly any. Style very slender and protruding. Nutlets stony, smooth, fixed by their base. Very rough-bristly homely plants.

7. LITHOSPERMUM. Corolla funnel-form or salver-shaped, with rounded lobes imbricated in the bud, with or without evident short and broad scales or folds in the throat. Anthers oblong, included; filaments hardly any. Nutlets stony, smooth or roughened, ovate, fixed by the base. Rough or hairy plants, mostly with red roots.

8. MYOSOTIS. Corolla very short-salver-form, the tube only about the length of the 5-toothed or 5-cleft calyx, the rounded lobes convolute in the bud, the throat with 5 small and blunt arching appendages. Anthers short, included. Nutlets smooth and hard, fixed by their base. Low and small, mostly soft-hairy plants, the small racemed flowers commonly bractless.

= = Throat with scales or appendages conspicuous, one before the base of each lobe, and closing or nearly closing the orifice.

‖ Corolla short-salver-shaped or nearly wheel-shaped; stamens included.

9. OMPHALODES. Corolla with tube shorter than the rounded lobes. Nutlets smooth, depressed, and with a hollow basket-like top. Flowers loosely racemed; no bracts. Low, smooth or smoothish herbs.

‖ ‖ Corolla tubular and more or less funnel-shaped.

10. SYMPHYTUM. Corolla straight, tubular-funnel-form, with short spreading lobes which are somewhat longer than the large awl-shaped scales and the linear or lanceolate anthers. Style slender, commonly protruding. Nutlets erect, smooth, coriaceous, fixed by a hollowed base. Coarse herbs, branching and leafy, with thickened or tuberous roots, the juice mucilaginous and bitterish, used in popular medicine. Flowers nodding in raceme-like often forked clusters, either naked or leafy-bracted at base.

** * Corolla or stamens (or both) irregular.*

11. LYCOPSIS. Corolla with a curved tube, slightly oblique 5-lobed border, and bristly-hairy scales in the throat. Stamens included in the tube. Nutlets rough-wrinkled, erect, fixed by a hollowed base. Coarse, rough-bristly plants.

12. ECHIUM. Corolla irregular, two of the spreading lobes of the corolla shorter than the others, funnel-form, naked in the throat. Stamens unequal, ascending, more or less protruding; filaments and style long and slender. Stigmas 2. Nutlets erect, leathery, rough-wrinkled.

1. HELIOTRÒPIUM, HELIOTROPE. (Greek: *turning to the sun.*)

* *Fruit 4-lobed, and separating into 4 simple nutlets.*

+ *Spikes only in pairs, or the lateral ones solitary; flowers white.* ①

H. Curassávicum, Linn. Sandy shores and banks from Va. and Ill., S.; very smooth and pale; leaves oblong, spatulate, or lance-linear, thickish, veinless.

H. Europæum, Linn. Old gardens and waste places S., introduced from Eu.; hoary-downy, 6′–18′ high; leaves oval, long-petioled, veiny.

+ + *Spikes collected in terminal and several times forked cymes.* 2

H. Peruviànum, Linn. COMMON HELIOTROPE. Pubescent, with ovate-oblong or lance-ovate, very veiny rugose leaves, and vanilla-scented, pale blue-purple flowers; woody-stemmed or shrubby house and bedding plants from Peru.

* * *Fruit 2-lobed, separating into 2 carpels, each 2-celled.*

H. Índicum, Linn. INDIAN HELIOTROPE. Hairy low plant, nat. from India as a weed in waste ground S.; with ovate, heart-shaped leaves, and solitary spikes of small purplish flowers, in summer; a cavity before each seed-bearing cell of the lobed fruit. ①

2. CYNOGLÓSSUM, HOUNDS'-TONGUE (which the name means in Greek). Flowers summer. Nutlets form burs which adhere to animals and clothing.

C. officinàle, Linn. COMMON H. Coarse weed from Eu., common in pastures, yards, and roadsides; leafy, soft-pubescent, with spatulate or lance-oblong leaves, the upper ones closely sessile, crimson purple corolla, and flat, somewhat margined nutlets. ②

C. Virgínicum, Linn. WILD COMFREY. Bristly-hairy, with simple stem, leafless above and bearing a few corymbed naked racemes of blue flowers, the stem leaves lance-oblong with heart-shaped clasping base, the nutlets very convex. Can., S. 2

3. ECHINOSPÉRMUM, STICK-SEED. (Greek: *hedgehog* and *seed*, from the nutlets.)

E. Lappula, Lehm. Weed of waste grounds, especially N.; roughish-hairy, erect, 1°–2° high, with lanceolate leaves, small blue flowers, and nutlets with rough-tubercled back and thickly-prickled margins; flowers all summer. Eu. ①

E. Virgínicum, Lehm. BEGGAR'S LICE. Thickets and open woods, a common weed; 2°–4° high, with slender, widely spreading branches, thin, oblong-ovate leaves tapering to both ends, forking and diverging racemes of very small whitish or bluish flowers on pedicels reflexed in fruit, and convex barbed-prickly small nutlets. ① ②

4. BORÀGO, BORAGE. (Old name, supposed corruption of *cor ago*, from imagined cordial properties.)

B. officinàlis, Linn. COMMON B. Cult. from Eu., in old gardens for ornament and as a bee plant; spreading, branched, beset with sharp and whitish spreading bristles; leaves oval or oblong-lanceolate; flowers loosely racemed, handsome, blue or purplish, with dark anthers, in summer. ①

5. **MERTÉNSIA.** (*Prof. F. C. Mertens*, of Germany.) 2*l*

* *Throat of the corolla naked, and the limb entire.*

M. Virgínica, DC. Smooth Lungwort. Very smooth and pale, leafy, 1°–2° high, with obovate, entire leaves, those of the root long-petioled; handsome flowers spreading or hanging on slender pedicels in loose raceme-like clusters, the light blue or at first purple corolla 1′ long; flowers spring. Alluvial soil, N. Y., W. and S.

* * *Throat crested, and corolla limb 5-lobed.*

M. marítima, Don. Sea Lungwort. Spreading or decumbent, glaucous, smooth; leaves fleshy, ovate to spatulate, the upper surface papillose; corolla white, twice as long as the calyx. Seacoast, Cape Cod, N.

6. **ONOSMÒDIUM**, FALSE GROMWELL. (Name means *like Onosma*, a European genus of this family.) Wild plants of the country, mostly in rich soil, in dry or alluvial ground; flowers leafy-bracted, greenish or yellowish-white, in summer. 2*l*

O. Virginiànum, DC. Clothed with harsh but appressed short bristles, 1°–2° high, with oblong leaves, and lance-awl-shaped lobes of narrow corolla sparingly bristly outside. N. Eng., W. and S.

O. Caroliniànum, DC. Shaggy with rough and spreading bristles; stout, 3°–4° high, with lance-ovate or oblong-acute leaves, and lobes of rather broad corolla triangular and thickly hairy. N. Y., W. and S.

Var. **mólle**, Gray. Hoary, with softer and whitish appressed hairs, the oblong-ovate bluntish leaves strongly ribbed, and lobes of the triangular-pointed lobes of the narrow corolla thickly hairy outside. Ill., W.

7. **LITHOSPÉRMUM**, GROMWELL, PUCCOON. (Greek: *stony seed.*) Flowers in late spring and summer, at length scattered or as if spiked, leafy-bracted.

* *Corolla white or yellowish only in the wholly naked throat, scarcely longer than the calyx; nutlets rough-wrinkled and pitted, gray and dull.* ① ②

L. arvénse, Linn. Corn Gromwell. Weed from Eu., in waste dry soil; 6′–12′ high, roughish-hoary, with lanceolate or linear leaves and inconspicuous flowers.

* * *Corolla dull whitish, rather short, with little downy scales or rather folds in the throat; nutlets smooth or with a few pores, often ivory-white.* 2*l*

L. officinàle, Linn. Common G. Of Eu., a weed by roadsides N.; 1°–2° high, branched above, with broadish-lanceolate, acute leaves, rough above but soft-downy beneath, and corolla longer than calyx.

L. latifòlium, Michx. From W. N. Y., W. and S.; larger and rougher than the last, ovate and lance-ovate pointed leaves 2′–4′ long and prominently ribbed, those from the root larger and roundish; corolla shorter than calyx.

* * * *Corolla bright orange-yellow, showy, longer than calyx, almost salver-shaped, with little appendages in the throat evident; nutlets smooth, usually ivory-white.*

L. hírtum, Lehm. Hairy Puccoon. Sterile ground, N. Y., S. and W.; 1°–2° high, roughish-bristly, with lanceolate or linear leaves, or those next the flowers ovate-oblong and bristly-ciliate, the crowded

flowers peduncled; tube of the corolla scarcely longer than the breadth of the border ($\frac{3}{4}'$–$1'$) and woolly-bearded at base inside.

L. canéscens, Lehm. HOARY P. Softer-hairy and somewhat hoary, $6'$–$15'$ high, smaller-flowered than the preceding, and tube of corolla smooth at base inside. Plains and wood borders, Can., S.

L. angustifòlium, Michx. Leaves linear; tube of corolla $1'$ or more long, many times longer than the eroded-toothed lobes. Sterile soil, Mich., W. and S.

8. MYOSÒTIS, FORGET-ME-NOT or SCORPION GRASS. (Greek: *mouse-ear*, from the short soft leaves of some species.) Flowers spring and summer.

* *Calyx remaining open in fruit, its hairs straight and glandless.*

M. palústris, With. TRUE F. In gardens and some waste places; with loosely branched stems ascending from a creeping base, rough-pubescent lance-oblong leaves, moderately 5-cleft calyx shorter than the spreading pedicels, and the lobes shorter than the calyx tube; corolla light blue with a yellow eye. 2

M. láxa, Lehm. Flowers smaller and paler, on longer pedicels; pubescence appressed; calyx lobes as long as the tube; habit lax. N. Y., E.

* * *Calyx closing or erect in fruit, the hairs hooked or glandular.*

M. arvénsis, Hoffm. Hirsute, with lance-oblong, acutish leaves, racemes naked at base and stalked, small blue corolla, pedicels spreading in fruit and longer than the 5-cleft equal calyx, the lobes of which are closed in fruit, and the tube beset with some hooked or glandular-tipped hairs. Fields. ① 2

M. vérna, Nutt. Bristly-hirsute, erect ($4'$–$10'$ high), branched from base, with oblong and blunt leaves, racemes leafy at base, very small mostly white corolla, pedicels in fruit erect and appressed at base, but abruptly bent outwards near the apex, and rather shorter than the unequal, very bristly calyx, some of its bristles hooked or glandular at their tip. Dry grounds. ① ②

9. OMPHALÒDES. (Greek: referring to the *navel-shaped* depression on the upper face of the nutlets.) Cult. from Eu. for ornament.

O. vérna, Moench. BLUE OR SPRING NAVELWORT. Spreading by leafy runners; leaves ovate or somewhat heart-shaped, $2'$–$3'$ long, pointed, green; flowers azure-blue, in spring. 2

O. linifòlia, Moench. WHITE N. Erect, $6'$–$12'$ high, loosely branched, very pale or glaucous, with broadly lanceolate leaves sparingly ciliate, the upper sessile, white or bluish flowers, and turgid nutlets toothed around the margin of the cavity. ①

10. SÝMPHYTUM, COMFREY. (Greek: *grow together*, alluding probably to supposed healing properties.) Cult. from Old World. 2

S. officinàle, Linn. COMMON C. Rather soft-hairy; the branches winged by the decurrent bases of the oblong-lanceolate leaves; corolla yellowish-white. Cult. for forage and ornament; naturalized sparingly in moist grounds. Eu.

S. aspérrimum, Sims. PRICKLY C. Stem and widely spreading branches excessively rough with short and somewhat recurved little prickles, not winged; calyx lobes short; corolla reddish purple in bud, changing to blue. Cult. like the other. Caucasus.

11. **LYCÓPSIS**, BUGLOSS. (Greek: *wolf* and *face.*) European weed. ①

L. arvénsis, Linn. FIELD or SMALL BUGLOSS. Very rough-bristly weed, about 1° high, in sandy fields E.; with lance-oblong leaves, and small blue corolla little exceeding the calyx.

12. **ÈCHIUM**, VIPER'S BUGLOSS. (Greek word for *viper.*) ②

E. vulgâre, Linn. COMMON V. or BLUEWEED. Cult. from Eu., in old gardens, and a weed in fields, E.; 1°–2° high, very rough-bristly, with lanceolate sessile leaves, and showy flowers in racemed clusters, the purple corolla changing to bright blue, in summer.

LXXIX. CONVOLVULACEÆ, CONVOLVULUS FAMILY.

Twining, trailing, or rarely erect plants (ours herbs), commonly with some milky juice, alternate leaves, no stipules; regular monopetalous flowers with 5 (rarely 4) imbricated sepals, as many separate stamens, corolla convolute or twisted in the bud, a 2–4-celled ovary (or 1-celled and ovaries several or many in Nolana) and pod with only 1 or 2 ovules erect from the base of each cell, becoming large seeds, containing a curved or coiled conspicuous embryo in some mucilaginous (or, when dry, harder) albumen.

I. CONVOLVULUS SUBFAMILY PROPER; with ordinary foliage, axillary peduncles bearing one or more usually showy flowers, and embryo with broad leaf-like cotyledons folded and crumpled in the seed. (Lessons, Fig. 40–43.) Calyx of 5 separate sepals.

* *Style single and entire; stigmas* 1–3.

1. IPOMŒA. Calyx naked, *i.e.* not inclosed by a pair of leafy bracts. Corolla nearly salver-shaped or trumpet-shaped, with a long tube, the border not twisted in the bud. Stamens and style included or protruded. Stigma capitate, 2–3-lobed. Pod 2–4-celled; cells 1-seeded. (Lessons, Figs. 250, 251.)
2. CONVOLVULUS. Calyx naked or surrounded and inclosed by a pair of large, leafy heart-shaped bracts. Corolla open funnel-form or almost bell-shaped. Stamens included. Stigmas 2, linear. Pod 2-celled; cells 2-seeded.
3. NOLANA. Calyx 5-cleft, foliaceous. Corolla short and open funnel-form, plaited in the bud. Stamens 5. Style 1; stigma capitate or club-shaped. Ovaries 3–40 collected in a circle or heap around the base of the style, becoming 1–4-celled drupelets or nutlets, each cell 1-seeded.

* * *Style* 2-*cleft or* 2 *separate styles, rarely* 3. *Spreading or trailing, not twining.*

4. BREWERIA. Like Convolvulus, but the styles 2 or sometimes 3, or in one species 2-cleft, and stigmas capitate. Peduncles 1–7-flowered.
5. EVOLVULUS. Corolla short and open funnel-form, or almost wheel-shaped. Styles 2, each 2-cleft; the 4 stigmas obtuse. Pod 2-celled; cells 2-seeded.

II. DODDER SUBFAMILY; slender parasitic twiners, without green herbage and with only some minute scales in place of leaves; embryo slender and spirally coiled in the seed, destitute of cotyledons.

6. CUSCUTA. Calyx 4–5-cleft, or of 5 separate sepals. Corolla short, 4–5-cleft. Stamens with a scale-like mostly fringed appendage at their base. Styles 2 in our species. Ovary 2-celled; cells 2-ovuled. Pod commonly 4-seeded.

1. IPOMŒA, MORNING-GLORY, SWEET POTATO, etc. (Greek-made name.) Many attractive cult. species.

* *Stamens and style exserted; flowers bright red, opening by day, small for the genus.*

I. Quâmoclit, Linn. (or QUÁMOCLIT VULGÀRIS). CYPRESS VINE. Cult. from Trop. Amer.; leaves pinnately parted into slender, almost thread-shaped divisions; peduncles 1-flowered; border of the narrow corolla 5-lobed. (Lessons, Fig. 250.)

I. coccínea, Linn. Leaves heart-shaped, pointed; sepals awn-pointed; peduncles several-flowered; border of (1′ long) corolla merely 5-angled. In gardens, and run wild S. Trop. Amer. (Lessons, Fig. 251.)

* * *Stamens and style short-exserted; flowers white, opening once only and at night, very large and long-tubed.*

I. **Bòna-Nóx**, Linn. (or CALONÝCTION SPECIÒSUM). MOONFLOWER. Tall-twining, very smooth, but stems often beset with soft, almost prickly projections; leaves heart-shaped, halberd-shaped, or angled; peduncles long, 1–few-flowered; corolla salver-form, with a slender tube 3′–4′ long, and the border still broader, white with greener folds, fragrant. Trop. Amer., and evidently native in S. Fla. Variable, and sold under several names.

* * * *Stamens and style not exserted; colors various, and corolla mostly campanulate.*

– *Ovary and pod 3-celled (or abnormally 4-celled), with 2 seeds in each cell; stigma more or less 3-lobed; corolla funnel-form, opening in early morning for a few hours; stems twining freely, hairy, the hairs more or less retrorse.* — MORNING-GLORIES.

I. purpùrea, Lam. COMMON MORNING-GLORY. Cult. from Trop. Amer. and wild around dwellings; with heart-shaped, pointed, entire leaves, 3–4-flowered peduncles, and purple, sometimes variegated or nearly white corolla, 2′ long. ① (Lessons, Figs. 40–45, 90, 247, 283.)

I. hederàcea, Jacq. (I. NÍL.) Cult., or run wild S., native to Trop. Amer.; with heart-shaped, 3-lobed leaves, 1–3-flowered peduncles, slender-pointed sepals, and blue-purple or sometimes white corolla 1′–2′ long. ①

I. LIMBÀTA or I. ALBO-MARGINÀTA, of gardens, is a form of the preceding, with leaves little lobed, angled or entire, and larger corolla with deep violet border, edged with white, 2½′ broad.

– – *Ovary and pod generally 2-celled, the cells 2-seeded, or sometimes each cell divided by a partition making 4 1-seeded cells; stigma capitate, or the lobes, if any, only 2.*

– *Stems creeping or prostrate on the ground, not twining.*

I. Batátas, Lam. SWEET POTATO. Stems long and smooth, producing the large, fleshy, edible roots, for which the plant is cultivated; leaves variously heart-shaped, halberd-shaped, or triangular, sometimes cut-lobed; peduncles bearing 3 or 4 flowers; corolla funnel-form, purple, 1½′

long; pod with 4 one-seeded cells. Origin unknown, but likely derived from some Tropical American species. Flowers seldom appear. ♃ (Lessons, Fig. 86.)

++ ++ Stems twining or with a distinct twining tendency.

= Corolla with a large spreading limb.

‖ Flower, or at least the greater part of it, white.

I. lacunòsa, Linn. Low grounds, Penn. to Ill. and S.; twining, nearly smooth, with heart-shaped, nearly entire leaves, short 1–3-flowered peduncles, small white (sometimes purple-bordered) 5-lobed corolla about ½′ long and twice the length of the pointed ciliate sepals, and slightly hairy pod. ①

I. sinuàta, Ort. Stem (somewhat woody at the base) and petioles hairy, but the leaves nearly or wholly glabrous and 7-parted, the divisions lanceolate or narrower and sinuately cut; calyx as long as the tube of the white purple-eyed corolla. Ga., S. ♃

I. panduràta, Meyer. Wild Potato Vine or Man-of-the-earth. Sandy or gravelly soil, Can., S., often a bad weed; trailing or twining, stout, smooth, with heart-shaped and sometimes fiddle-shaped or halberd-3-lobed leaves, 1–5-flowered peduncles, small bracts, and open funnel-form white corolla with deep purple eye, 2′–3′ long; root very large and deep, weighing 10–20 lbs. ♃

‖ ‖ Flower red, blue, or purple throughout (rarely white in the first).

o Leaves broad and cordate, either lobed or entire.

I. Jalápa, Pursh. Light soil, along the coast S. Car., S.; creeping or twining, with heart-shaped or triangular, sometimes lobed leaves, downy beneath; flowers downy; corolla purplish-white with purple eye, 3′–4′ long, opening at night; pod partly 4-celled, with silky seeds; root extremely large and fleshy, often weighing 40–50 lbs. ♃

I. commutàta, Rœm. & Sch. Rather hairy, twining; with thin, heart-shaped, and sometimes angled or 3–5-lobed leaves, 4-angled 1–5-flowered peduncles about the length of the slender petioles; purple corolla 1′–2′ long, and 4–5 times the length of the pointed ciliate sepals; pod hairy. S. Car., S. ①

I. Leàri, Paxt. Cult. from S. Amer.; tender, slightly hairy, with heart-shaped and generally 3-lobed leaves, many Morning-glory-like flowers crowded on the summit of the peduncle, and deep violet-blue corolla 3′ long, and border 3′ wide; stigma capitate. ♃

I. rùbro-cærùlea, Hook. Smooth, greenhouse generally evergreen climber, with long-petioled, pale green, deeply cordate, acuminate leaves and 3–4-flowered peduncles; flowers large and handsome, rich blue, with a 5-angled limb; stigma 2-lobed. Mex. ♃

I. setòsa, Ker. Stems, petioles and ∞-flowered peduncles strongly setose or hispid; leaves deeply cordate and round-ovate, with 3 large lobes and round sinuses; flowers of medium size, red or purple-red, the tube cylindrical; stigma capitate. Greenhouses; from Brazil. ♃

o o Leaves narrow and sagittate.

I. sagittàta, Cav. Salt marshes, from N. Car., S.; smooth, with stems twining 2°–3° high, or trailing, narrow lanceolate or linear long-sagittate leaves, 1–3-flowered club-shaped peduncles, and the bright purple funnel-form corolla 2′–3′ long. ♃

= = Corolla with a swollen tube, but no spreading limb.

I. versícolor, Meissn. (Mina lobàta). House plant from Mexico, with broad and cordate 3-lobed leaves, and scirpoid racemes of small flowers, which are reddish at first, but soon change to orange and yellow; stigma capitate. ①

2. CONVÓLVULUS, BINDWEED. (From Latin *convolvo*, roll around or twine.) Flowers summer.

* *Calyx inclosed in 2 large leafy bracts.*

C. sèpium, Linn. HEDGE B. Wild in low grounds, also planted; twining freely, sometimes also trailing, spreading by running rootstocks; smooth, also a downy variety; leaves triangular and halberd-shaped or arrow-shaped, with the lobes at base obliquely truncate and sometimes toothed or sinuate; peduncles 4-angled; corolla white or light rose-colored, 1½′–2′ long. Variable; sometimes double-flowered in gardens. 2

C. spithamæus, Linn. Dry sterile ground; downy, not twining, 6′–12′ high; leaves oblong, some of them more or less auricled or heart-shaped at the base; corolla white, 2′ long. 2

* * *Calyx naked.*

C. arvénsis, Linn. FIELD BINDWEED. Eu.; a weed in waste places E.; spreading and low-twining, smoothish; leaves ovate-oblong and arrow-shaped; peduncles 1-flowered; corolla white tinged reddish, less than 1′ long. 2

C. tricolor, Linn. (C. MINOR, of gardens.) Cult. from S. Eu.; hairy, low, with ascending branching stems, lance-obovate or spatulate, almost sessile leaves, 1-flowered peduncles, rather large and showy flowers opening in sunshine, the corolla blue, with pale or white throat and yellow tube. ①

C. Mauritánicus, Boiss. Cult. from N. Africa; prostrate or twining, used in hanging baskets; plant soft white-hairy; leaves ovate, short-petioled, in 2 rows; flowers blue, with a white throat, 1′ across; calyx hairy. 2

3. NOLÀNA. (Latin: *nola*, a little bell.) Cult. for ornament, from coast of Peru and Chile; the following procumbent and spreading, rather fleshy-leaved, smooth, except some scattered hairs on the stalks, the showy blue flowers solitary on axillary or lateral peduncles, opening in sunshine, all summer.

N. atriplicifòlia, Don. Leaves obovate or broadly spatulate (resembling those of Spinach, whence the specific name); sky-blue corolla 2′ wide with white and yellowish center; ovaries numerous in a heap, each 1-celled and 1-seeded. ①

N. prostràta, Linn. Less common; has more petioled, rather narrower leaves, smaller pale violet-blue flower striped with purple, and few ovaries, each of 2–4 cells. ①

4. BREWÈRIA. (*Samuel Brewer*, an English botanist.) Low, small-flowered; corolla more or less silky or hairy outside; flowers summer; chiefly S. 2

B. humistràta, Gray. Dry pine barrens from Va., S.; sparsely hairy or smoothish; leaves varying from oblong, with heart-shaped base to linear; sepals smooth; corolla white, almost 1′ long; filaments hairy; styles united at base.

B. aquática, Gray. Finely soft-downy; leaves varying as in the preceding; sepals silky; corolla pink or purple, ½′ long; filaments smooth; styles nearly separate. N. Car., S.

B. Pickeríngii, Gray. Sandy barrens from N. J., S. and W., scarce; leaves nearly linear, narrow, tapering to a sessile base; bracts leaf-like and longer than the flowers; sepals hairy; corolla white, hardly ½′ long; styles united to above the middle, and with stamens also protruding.

5. EVÓLVULUS. (From Latin for *unroll;* that is, it does not twine.) Low and diminutive small-flowered plants. Flowers summer. 2

E. argénteus, Pursh. Tufted from a woody base, 5′–7′ high, silky-woolly all over; broadly lanceolate leaves crowded, usually nearly sessile, as are the flowers in their axils; corolla purple, ¼′ broad. Plains, Dak., S.

E. seríceus, Swartz. Damp ground Fla., W.; slender-stemmed, silky with fine appressed hairs, except the upper face of the scattered lance-linear leaves; corolla white or bluish, not ½′ broad.

6. CÚSCUTA, DODDER. (Old name, of uncertain derivation.) Plants resemble threads of yarn, yellowish or reddish, spreading over herbs and low bushes, coiling around their branches, to which they adhere, robbing them of their juices. Flowers small, mostly white, clustered.

* *Stigmas slender; pod opening by a transverse division all round near the base, leaving the partition behind. Natives of Eu.; flowers early summer.*

C. Epílinum, Weihe. FLAX DODDER. Growing on flax, which it injures; occasionally found in our flax fields; flowers globular, in scattered heads; corolla 5-parted. ①

* * *Stigmas capitate; pods bursting irregularly if at all; wild species of the country, mostly in rich or low ground; flowers summer and autumn.* ①

+ Sepals united; ovary and pod depressed-globose.

++ Flowers sessile in compact mostly continuous clusters; corolla with a short and wide tube, remaining at the base of the ripe pod; styles usually shorter than the ovary.

C. arvénsis, Beyr. On low herbs, in fields and barrens from N. Y., S. and W.; flowers earliest (June, July) and smallest; tube of corolla shorter than its 5 lanceolate, pointed, spreading lobes, much longer than the stamens.

C. chlorocárpa, Engelm. On low herbs, in wet soil, from Del., W. and S. W.; orange-colored; open bell-shaped corolla with lobes about the length of the mostly 4 acute lobes and the stamens; pod large, depressed, greenish-yellow.

++ ++ Flowers panicled or in compound cymes, the withered corolla remaining on the top of the pod; styles mostly longer than the ovary.

C. tenuiflòra, Engelm. On shrubs and tall herbs, Pa., W. and S., in swamps; pale; tube of the corolla twice the length of its ovate, acute, spreading lobes, and of the ovate blunt calyx lobes.

+ + Sepals united; ovary and pod pointed.

C. infléxa, Engelm. On shrubs and tall herbs in prairies and barrens, N. Eng., W. and S.; corolla fleshy, mostly 4-cleft, its tube no longer than the ovate, acutish, crenulate, erect or inflexed lobes of the corolla and the acute, keeled calyx lobes.

C. decòra, Engelm. Wet prairies Ill., S. W.; with larger flowers, the corolla broadly bell-shaped, its 5 lobes lance-ovate, acute, and inflexed.

C. Gronòvii, Willd. The commonest E. and W.; on coarse herbs and low shrubs in wet places; bell-shaped corolla with tube usually longer than its 5 (rarely 4) ovate blunt spreading lobes; its internal scales large and copiously fringed.

+- + + *Sepals 5 and distinct, subtended by 2 or more sepal-like bracts.*

C. compácta, Juss. On shrubs, Ont., S. and W.; bracts (3–5) and sepals round and appressed; tube of the corolla cylindrical.

C. glomeràta, Choisy. On Golden Rods and other coarse Compositæ, from Ohio, W. and S.; the numerous oblong, scarious bracts closely imbricated with recurving tips; sepals similar, shorter than the cylindraceous tube of the corolla.

LXXX. SOLANACEÆ, NIGHTSHADE FAMILY.

Plants with rank-scented herbage (this and the fruit more commonly narcotic-poisonous), colorless juice, alternate leaves (but apt to be in pairs and unequal), regular flowers (on bractless pedicels) with the parts usually in fives (stamens 4 in Brunfelsia, and 1 or more of them rudimentary in some other genera), but the ovary mostly 2-celled, the many-seeded placentæ in the axis. The seeds have a slender, usually curved embryo, in fleshy albumen. (Lessons, Figs. 50, 51.) The order runs into Scrophulariaceæ, which a few species approach in a somewhat irregular corolla, but their stamens are as many as the lobes (except Nos. 9 and 15–17). Mostly herbs.

* *Fruit a fleshy (or in No. 5, dryish) berry.*

+- *Corolla wheel-shaped, lobed or parted into 5 or sometimes more divisions, plaited and valvate or the margins turned inwards in the bud; the tube very short; anthers conniving around the style.*

1. LYCOPERSICUM. Like Solanum, except that the anthers are united by a membrane at their tips and the cells open lengthwise. Leaves pinnately compound.
2. SOLANUM. Stamens with anthers equaling or mostly longer than the very short filaments, usually not united, the cells opening by a hole at the apex. (Lessons, Figs. 252, 253.) Leaves simple or pinnate.
3. CAPSICUM. Stamens with slender filaments much longer than the short and separate commonly heart-shaped anthers, their cells opening lengthwise. Berry sometimes dryish and inflated, then becoming 1-celled.

+- + *Corolla between wheel-shaped and funnel-form, plaited in the bud, the border very moderately if at all lobed; anthers separate, opening lengthwise; calyx bladdery-inflated after flowering, inclosing the globular berry.*

4. PHYSALIS. Calyx 5-cleft. Corolla mostly somewhat 5-lobed. Stamens erect. Fruit a juicy, often edible, 2-celled berry.
5. NICANDRA. Calyx 5-parted and angled, the divisions somewhat arrow-shaped. Corolla with widely-spreading border almost entire. Fruit a dryish 3–5-celled berry.

+- + + *Corolla bell-shaped, funnel-form, tubular, or salver-shaped; anthers separate opening lengthwise; calyx not bladdery-inflated.*

++ *Stamens normally 5 (exception sometimes in No. 8).*

= *Calyx 5-parted to near the base, the lobes leafy.*

6. ATROPA. Calyx with ovate divisions, in fruit enlarging and spreading under the globose purple berry. Corolla between bell-shaped and funnel-form, with 5 triangular-ovate lobes. Stamens and style somewhat declined, slender.

= = *Calyx bell-shaped, cup-shaped, or short-tubular, in fruit persistent under or partly covering the* 2*-celled berry; shrubs, with entire feather-veined leaves.*

7. CESTRUM. Corolla tubular funnel-form or club-shaped, the lobes folded or plaited lengthwise in the bud. Stamens included. Stigma capitate. Ovary with few ovules in each cell. Berry few-seeded. Flowers in clusters.

8. LYCIUM. Parts of the flower often in fours. Corolla funnel-form, bell-shaped or tubular, the lobes imbricated in the bud. Stigma capitate. Berry many-seeded, red or reddish. Flowers solitary or umbeled, lateral.

++ ++ *Stamens* 4, *included in the narrow throat of the salver-shaped corolla.*

9. BRUNFELSIA. Shrubs, with glossy oblong leaves. Corolla with 5 rounded and about equal lobes, two of them, however, a little more united. Anthers all alike.

* * *Fruit a dry dehiscent capsule.*

+ *Stamens normally* 5, *all perfect.*

++ *Calyx urn-shaped in fruit, inclosing the pod; corolla considerably irregular.*

10. HYOSCYAMUS. Calyx 5-lobed, the spreading border becoming reticulated, inclosing the 2-celled pod, which opens by the top falling off as a lid. Corolla short funnel-form, with the plaited border more or less oblique and unequal. Stamens declined.

++ ++ *Calyx* 5*-parted to near the base, the lobes foliaceous.*

11. PETUNIA. Calyx with narrow somewhat spatulate lobes much longer than the tube. Corolla funnel-form or somewhat salver-shaped, the 5-lobed border commonly a little unequal. Stamens included in the tube, unequal. Pod 2-celled, 2-valved.

++ ++ ++ *Calyx tubular, prismatic, or bell-shaped,*

= *Covering the pod or nearly so; corolla salver-shaped or funnel-form, the lobes plaited in the bud; seeds minute.*

12. NIEREMBERGIA. Corolla with very slender thread-like tube (½′–1′ long), abruptly expanded at the narrow throat into a saucer-shaped or almost wheel-shaped 5-lobed border. Stamens short, borne on the throat. Stigma kidney-shaped and somewhat 2-lipped. Flowers scattered.

13. NICOTIANA. Corolla with a regular 5-lobed border. Stamens inserted on its tube, included; filaments straight. Stigma capitate. Pod 2–4-valved from the apex. Flowers more or less racemed or panicled.

= = *Prismatic, falling away after flowering, leaving the* 2*–*4*-celled pod naked.*

14. DATURA. Corolla funnel-form, strongly plaited in the bud, and with 5 or more pointed teeth. (Lessons, Figs. 246, 282.) Filaments slender. Stigma somewhat 2-lobed or 2-lipped. Pod globular, in the common species prickly and 4-celled, but the 2 placentæ-bearing or false partitions often incomplete. Seeds large and flat, somewhat kidney-shaped. Flowers terminal or in the forks.

+ + *Stamens* 4 *only, included within the narrow throat of the salver-shaped corolla.*

15. BROWALLIA. Herbs, mostly a little pubescent and clammy. Corolla with somewhat unequally 5-lobed border, the lobes with a broad notch. Two of the anthers shorter and only 1-celled. Leaves alternate and entire.

+ + + *Anther-bearing stamens* 4, *and a sterile filament; corolla with wide throat.*

16. SALPIGLOSSIS. Herbs, with cut-toothed or pinnatifid alternate leaves. Corolla funnel-form, with very open throat, a little oblique or irregular, the lobes all with a deep notch at the end. Pod oblong.

+ + + + *Stamens with* 2 *good anthers, the* 2 *or* 3 *others small and abortive.*

17. SCHIZANTHUS. Calyx 5-parted, the divisions narrow. Corolla imbricated and not plaited in the bud; the smaller tip 3-parted; the larger 5-cleft, and the lobes again 2-cleft or deeply notched, the tube shorter than the divisions, which appear as if cut up, the middle lobe of the smaller lip, towards which the stamens and style are inclined, more or less hooded or sac-like. Stigma minute. Leaves alternate, pinnate, or pinnately cut.

1. LYCOPÉRSICUM, TOMATO, LOVE APPLE. (Greek: *wolf peach.*)

L. esculéntum, Mill. TOMATO. Cult. from trop. Amer.; includes manifold varieties and forms; hairy, rank-scented; leaves interruptedly pinnate, larger leaflets cut or pinnatifid, ovate or ovate-oblong and pointed; flower clusters short and forked; flowers yellowish, by cultivation having their parts often increased in number, the esculent red or yellow berry becoming several-celled. The little improved types, like the Cherry Tomato (var. CERASIFÓRME) have 2-celled fruits, a weaker habit and smaller leaves than the larger-fruited sorts. ⓘ

L. pimpinellifòlium, Dunal. CURRANT T. Weaker and nearly smooth, the leaflets small and thin and nearly or quite obtuse; fruit the size of large currants, in long 2-sided racemes. Sparingly cult., mostly as a curiosity. Peru. ⓘ

2. SOLÀNUM, NIGHTSHADE, etc. (Derivation uncertain.) Flowers mostly in corymb- or raceme-like clusters, in summer.

* *Plants not at all prickly; anthers blunt.*

+ *Climbing or twining perennials.*

S. Dulcamàra, Linn. BITTERSWEET. Nat. from Eu., in moist cult. and waste grounds; smoothish, with tall stems woody at base and disposed to climb, ovate and heart-shaped leaves, some of the upper ones halberd-3-lobed, or with one or two pairs of smaller leaflets or lobes at base; corolla violet-purple with a pair of greenish spots on the base of each lobe, and oval red berries. 2ℓ (Lessons, Fig. 252.)

S. jasminoìdes, Paxt. Woody-stemmed house plant from Brazil, tall-climbing by its petioles, very smooth, with oblong ovate or slightly heart-shaped, entire leaves, or some of them divided into 3 leaflets, and clusters of white or bluish flowers. 2ℓ (Lessons, Fig. 172.)

+ + *Erect shrubs, of house culture.*

S. Pseùdo-Cápsicum, Linn. JERUSALEM CHERRY. Shrubby house plant from Madeira, cult. for the ornamental bright red berries, resembling cherries; smooth, with lance-oblong entire leaves and small white flowers in solitary peduncles or small lateral clusters.

S. Capsicástrum, Link. Fruit scarlet, the size of a filbert; flowers white, in short racemes nearly opposite the leaves, the latter twin, one much smaller than the other, entire or repand, oblong-lanceolate or lance-obovate. There is a form with variegated leaves. Brazil.

+ + + *Erect herbs, annuals or cult. as annuals.*

S. nìgrum, Linn. BLACK OR COMMON NIGHTSHADE. Low weed of shady grounds; much branched, nearly smooth, with ovate wavy-toothed or sinuate leaves, very small white flowers, and globular black berries, said to be poisonous. ⓘ

S. tuberòsum, Linn. POTATO. Cult. from Chile for the esculent tubers, and native as far N. as S. Col.; leaves pinnate, of several ovate leaflets and some minute ones intermixed; flowers blue or white; berries round, green. 2ℓ (Lessons, Figs. 102, 253.)

S. muricàtum, Ait. PEPINO, MELON SHRUB, etc. Branching and bushy; stems and oblong-lanceolate entire leaves lightly hairy; flowers sky-blue, in terminal fascicles; fruit egg-shaped, 3′–4′ long and pointed, at maturity yellow overlaid with streaks of violet-purple, the flesh edible, with the flavor of a muskmelon. Subshrub in trop. Amer., where it is native, but treated as an herb in cultivation.

* * *More or less prickly herbs, with acute elongated-lanceolate anthers.*

+ *Very prickly calyx inclosing the dry berry; anthers declined, unequal, one of them much longer than the rest; leaves sinuately once to thrice pinnatifid.* ①

S. rostràtum, Dunal. Wild on plains W. of Mississippi, and becoming a weed in some gardens; has yellow flowers, 1′–1½′ in diameter.

+ + *Calyx mostly somewhat prickly but not inclosing the fruit; anthers nearly equal.*

S. Carolinénse, Linn. HORSE NETTLE. Roughish-downy, 1° high, with ovate-oblong, angled or sinuate-lobed leaves, yellowish prickles, and pale blue or white flowers almost 1′ wide. Weed in sandy soil, from Conn., S. ♃

S. aculeatíssimum, Jacq. Weed introduced into waste places, N. Car., S., 1°–2° high, bristly hairy, greener and more prickly than the foregoing, with smaller white flowers. Tropics. ①

S. Melongèna, Linn. EGGPLANT, AUBERGINE, GUINEA SQUASH. Cult. for the large oblong or ovate violet-colored or white esculent fruit (2′–12′ long); leaves ovate, rather downy, obscurely sinuate; corolla violet with yellow eye. The common cult. form is var. ESCULÉNTUM. The Early Dwarf Purple Egg Plant and its allies, distinguished by diffuse habit, fewer prickles, small flowers, and early pear-shaped fruits, is var. DEPRÉSSUM. India. ①

S. integrifòlium, Poir. (S. COCCÍNEUM of gardens). CHINESE SCARLET EGGPLANT. Tall prickly herb, with sinuate-notched or -lobed leaves bearing strong yellow spines on the midrib below; flowers small and white, in clusters of 2–6, followed by red or yellow lobed or angled, inedible fruits, 1′–2′ across. Probably African. ①

3. CÁPSICUM, CAYENNE or RED PEPPER. (Name obscure.) Tropics.

C. ánnuum, Linn. COMMON C. or CHILE PEPPER. Cult. for the large oblong or globular and often angled dry berry (red or green), which is exceedingly pungent, and used as a condiment; leaves ovate, entire; flowers white, with truncate calyx. Many diverse forms. ①

4. PHÝSALIS, GROUND CHERRY, HUSK or STRAWBERRY TOMATO. (Greek: *bladdery*, from the inflated fruiting calyx.)

* ♃ *Low stems (6′–20′ high) from slender creeping rootstocks; anthers yellow; fruiting calyx loosely inflated, 5-angled, much larger than the edible berry.*

P. Alkekéngi, Linn. STRAWBERRY TOMATO. Cult. from S. Eu., and running wild E.; rather downy; leaves triangular-ovate, pointed; corolla greenish-white, 5-lobed, not spotted; large fruiting calyx ovate, turning brilliant red; berry red.

P. lanceolàta, Michx. Pubescent, or somewhat hairy, but not clammy; leaves varying from ovate to lanceolate, entire or sparingly wavy-toothed; corolla yellowish with a darker throat and slightly 5–10-toothed border; fruiting calyx sunken at the base, hirsute; berry red. Pa., W. and S.

P. viscòsa, Linn., but not viscous; white-pubescent; stems ascending or spreading; leaves ovate or oval, or sometimes obovate, undulate or entire; corolla greenish-yellow, with a darker eye; calyx globose-ovate in fruit; berry yellow or orange. Near the coast, Va., S.

P. Virginiàna, Mill. Widely spreading and viscid; leaves ovate or oblong, repand or obtusely toothed or rarely entire; corolla about 1′ broad, 5–10-toothed, sulphur-yellow with a brown eye; fruiting calyx strongly 5-angled; berry yellow. Can., S.

* * ① *Stems* 1°–3° *high (or prostrate) from a small root; flowers small, light greenish-yellow; anthers commonly tinged with blue or violet.*

P. pubéscens, Linn. Common Husk or Strawberry Tomato, Dwarf Cape Gooseberry. Clammy-hairy or downy; stems much spreading, usually not rising over 1°; leaves ovate or heart-shaped, angulate-toothed; corolla brown-spotted in the throat; sharply 5-angled fruiting calyx loosely inclosing the yellow or greenish, not glutinous, berry. Low ground, and cult.

P. angulàta, Linn. Nearly glabrous, not viscid; leaves sharply cut-toothed; peduncles slender; very small corolla not spotted; fruiting calyx 10-angled, loose, at length filled by the greenish-yellow berry. Pa., W. and S.

P. Philadélphica, Lam. Almost glabrous, erect; leaves ovate or oblong and oblique at base, slightly toothed or angled; corolla dark colored in the throat, over ½′ wide; fruiting calyx globose, completely filled by the large reddish or purple edible berry, and open at the mouth. Pa., W. and S.

P. Peruviàna, Linn. (P. édulis). Cape Gooseberry. Strong plant, 1°–3°, with thick, soft, cordate-ovate, irregularly toothed or notched fuzzy leaves; flower open bell-shaped, the limb widely spreading and light yellow, the throat blotched and veined with purple spots; anthers purple; fruiting calyx 10-angled, inflated, inclosing a yellow, not glutinous berry. Peru.

5. NICÁNDRA, APPLE OF PERU. (Named after the poet *Nicander*.) Only one species; flowers summer. ①

N. physaloìdes, Gærtn. Tall smooth weed from Peru, sparingly wild in moist waste grounds; with ovate-angled or sinuate-toothed leaves, and solitary peduncles, bearing a rather large, pale blue flower.

6. ÁTROPA, BELLADONNA. (Named after one of the Fates.) 2

A. Belladónna, Linn. Sparingly cult. from Eu.; low and spreading, nearly smooth, with ovate, entire, pointed leaves, flowers single or in pairs nodding on lateral peduncles, dull-purple corolla, and handsome purple berry; whole plant poisonous, used in medicine.

7. CÉSTRUM. (Greek; the derivation obscure.) Shrubs of warm climates, chiefly American; a few cult. in conservatories.

C. élegans, Schlecht. (Habrothámnus élegans). From Mexico; has the branches and lower face of the ovate-lanceolate or oblong pointed leaves downy-pubescent, terminal corymbs, and rose-purple club-shaped corollas less than 1′ long.

C. noctúrnum, Linn. Smooth ovate leaves, and axillary clusters of yellowish green slender flowers, very sweet-scented at night. S. Amer.

C. Párqui, L'Her. Chile; has lanceolate smooth leaves very acute at both ends, and a terminal panicle of crowded spikes or racemes of tubular funnel-form or partly club-shaped dull-yellow flowers, fragrant at night.

8. LÝCIUM. (Named from the country of the original species, *Lycia*.) Trailing, climbing, or low spreading shrubs, usually spiny, with small leaves often clustered on lateral spurs, and small flowers, in spring and summer.

L. vulgàre, Dunal. Matrimony Vine. From the Mediterranean region; planted, and sparingly running wild in some places; slightly thorny, with

very long and lithe recurved or almost climbing branches, oblong-spatulate leaves, slender stalked flowers clustered in the axils, and pale greenish-purple 5-cleft corolla about equaling the 5 stamens; fruit obtuse, of little beauty.

L. Chinénse, Mill. CHINESE M. Less commonly cult. than the last, but more desirable on account of the large (1′ long) bright scarlet acute fruit which ripens in August and hangs until early winter; stems weak and prostrate, 10° long, spiny; leaves ovate and acute, more or less cuneate at the base; stamens longer than the bright purple corolla.

L. Carolinìànum, Walt. Wild in salt marshes S. Car., S.; low, spiny, with fleshy, thickened, almost club-shaped leaves, scattered small flowers, and 4-cleft purple corolla shorter than the 4 stamens.

9. BRUNFÉLSIA. (Named for the old herbalist, *Otto Brunfels*.) Conservatory shrubs, cult. under the name of FRANCÍSCEA, with showy flowers.

B. latifòlia, Benth. Very smooth, with oval or oblong acute leaves, and few fragrant flowers (lavender with a white eye, fading to white) at the end of the branches, 1½′ across. Brazil.

B. grandiflòra, D. Don. Peru; leaves elliptic-oblong, acuminate; flowers 2′ across, greenish.

10. HYOSCÝAMUS, HENBANE. (Greek: *hog* and *bean*, i.e., swine poison.) Flowers summer. ① ②

H. nìger, Linn. BLACK HENBANE. Of Eu., cult. in old gardens, and a weed in waste places; clammy-downy, strong-scented, narcotic-poisonous; with clasping, sinuate-toothed leaves, sessile flowers in one-sided leafy-bracted spikes, and dull yellowish corolla netted-veiny with purple.

11. PETÙNIA. (*Petun* is an aboriginal name of *Tobacco*.) Cultivated as garden annuals, from S. Amer. The common Petunias are mostly hybrids of the two following species; herbage clammy-pubescent; flowers large and showy, in summer.

P. nyctaginiflòra, Juss. Corolla white, the long narrow tube 3 or 4 times the length of the calyx; leaves oval-oblong and narrowed into a distinct petiole; plant stout and flowers strong-scented at evening. Still occasionally seen in old gardens.

P. violàcea, Lindl. Stems weaker; violet-purple or rose-red corolla, the short, broader, and ventricose tube hardly twice the length of the calyx; leaves ovate or oval, sessile or very nearly so. Rarely, if ever, seen in gardens in its pure form.

12. NIEREMBÉRGIA. (Named for *J. E. Nieremberg*, a priest and botanical collector in Buenos Ayres, whence the common species comes.) 2ℓ ①

N. grácilis, Hook. Cult. for ornament, under many varieties; low, with slender bushy branches, small, linear or spatulate-linear leaves, and scattered flowers produced all summer, white or veined or tinged with purple.

13. NICOTIÀNA, TOBACCO. (Named for *John Nicot*, one of the introducers of Tobacco into Europe.) Rank, acrid-narcotic, mostly clammy-pubescent plants, chiefly of America; leaves entire or merely wavy-margined.

* *Corolla with a broad or inflated tube, mostly red or greenish.*

N. Tabácum, Linn. COMMON T. The principal species cult. for the foliage; 4°–6° high, with lance-ovate, decurrent leaves 1°–2° long, or the upper lanceolate, panicled flowers, and rose-purple, funnel-form corolla 2′ long, with somewhat inflated throat and short lobes. S. Amer. ①

N. rústica, Linn. A weed in some places, is a low, homely plant, with ovate and petioled leaves 2′–5′ long, and green funnel-form corolla (1′ long) contracted under the short round lobes. Nativity unknown. ①

N. tomentòsa, Ruiz. & Pav. (N. COLÓSSEA.) Very tall (6°–10° high), strong herb, often with very large, broad-lanceolate to ovate, entire leaves (a yard long by two-thirds as wide), decurrent on the stem, and short flowers with exserted stamens. Cult. for its tropical appearance. S. Amer. ♃

* * *Corolla white, with a very long and narrow, nearly cylindrical tube.*

+ *Corolla lobes acute.*

N. longiflòra, Cav. Slender, 2°–3° high, cult. for its handsome white flowers, which open toward evening; corolla salver-shaped, the green tube 4′ and the lance-ovate acute lobes ½′ long; leaves lanceolate, undulate. ①

N. alàta, Link & Otto. (N. AFFÌNIS of gardens). Strong plant 3°–4°, clammy-pubescent; leaves lance-obovate and entire, or the upper ones lanceolate, the lower ones narrowed into a petiole-like base, which is dilated where it joins the stem; flowers very long (the slender tube 5′–6′), the limb deeply 5-cleft and unequal, opening at nightfall, and then fragrant. Common in gardens. Brazil.

+ + *Corolla lobes obtuse.*

N. noctiflòra, Hook. The handsome white flowers opening at evening (as the name denotes), is similar to N. longiflora, but with ovate-lanceolate petioled leaves, tube of corolla only 2′–3′ long, and its roundish lobes notched at the end. ①

N. suavèolens, Lehm. Nearly or quite smooth and glabrous, 1°–3°; leaves lance-obovate and wavy, tapering below; flowers 3′ long, the rounded divisions of the corolla overlapping and the limb, therefore, appearing as if nearly entire, sweet-scented. Australia.

14. DATÙRA, THORN APPLE, STRAMONIUM, etc. (Name altered from the Arabic.) Rank-scented, mostly large-flowered, narcotic-poisonous weeds, or some ornamental in cultivation.

* *Flower and the usually prickly 4-valved pod erect, the latter resting on a plate or saucer-shaped body which is the persistent base of the calyx, the whole upper part of which falls off entire after flowering; corolla with a 5-toothed border.* ①

D. Stramònium, Linn. COMMON T. or JAMESTOWN WEED, JIMSON WEED. Waste grounds; smooth, with green stems and white flowers (3′ long); leaves ovate, angled, or sinuate-toothed. Probably Asian. (Lessons, Fig. 246.)

D. Tátula, Linn. PURPLE T. A weed very like the other, but rather taller, with purple stem and pale violet-purple flowers. Trop. Amer.

* * *Pod nodding on the short recurved peduncle, rather fleshy, bursting irregularly, otherwise as in the foregoing section; flowers large, showy. Cult. from warm regions for ornament.* ① ♃

D. Mètel, Linn. Clammy-pubescent; leaves ovate, entire, or obscurely angled-toothed; corolla white, the 10-toothed border 4′ wide; capsule prickly. Trop. Amer.

D. meteloìdes, DC. Cult. from Mexico (under the name of D. Wrìghtii); like the other, but pale, almost smooth, the flower sweet-scented, and the corolla with more expanded 5-toothed border, 5′–6′ wide, white or pale violet. Capsule spiny.

D. fastuòsa, Linn. Downy; leaves ovate-acuminate, unequal at the base, repand-toothed; flowers erect, violet outside and white within, somewhat oblique; capsule rough. Showy, often double-flowered. E. Indies. ①

* * * *Flower and smooth 2-celled pod hanging, the former very large, 6′–10′ long; calyx splitting down lengthwise after flowering. Tropical American tree-like shrubs, cult. in conservatories; flowers sometimes double.*

D. (or Brugmánsia) *arbòrea*, Linn. Has ovate or lance-oblong, entire or angled pubescent leaves, long teeth to the corolla, and unconnected anthers.

D. suavèolens, Humb. & Bonpl. Has mostly entire and smooth leaves, short teeth to the corolla and the anthers sticking together. Mexico.

15. BROWÁLLIA. (Named for *Dr. John Browall*, of Sweden, first a friend, later a bitter opponent of Linnæus.)

B. demíssa, Linn. (named also B. elàta when the plant and the man it was named for grew exalted). From S. Amer.; cult. in the gardens, 1°–2° high, bushy-branched, with ovate leaves and handsome bright violet-blue flowers (1′ or less across, at length as it were racemed) produced all summer. ①

16. SALPIGLÓSSIS. (Greek for *trumpet-tongue*, from the curved apex of the style with dilated stigma likened to the end of a trumpet.)

S. sinuàta, Ruiz & Pav. Cult. from Chile as an ornamental annual or biennial, under various names and varieties, according to the color of the large flowers, dark-purple, or straw-colored and mostly striped; flowers all summer. In appearance resembles a Petunia.

17. SCHIZÁNTHUS. (Greek for *cut flower*, the corolla being as if cut into slips.) Cult. for ornament, from Chile; flowers summer. ①

S. pinnàtus, Ruiz & Pav. Slender, 1°–2° high; pubescent with fine glandular hairs, with leaves once or twice pinnate or parted into narrow divisions, and numerous handsome flowers, barely 1′ in diameter.

LXXXI. SCROPHULARIACEÆ, FIGWORT FAMILY.

Known on the whole by the 2-lipped or at least more or less irregular monopetalous corolla (the lobes imbricated in the bud), 2 or 4 didynamous stamens, single style, entire or 2-lobed stigma, and 2-celled ovary and pod containing several or many seeds on the placentæ in the axis; these with a small embryo in copious albumen. But some are few-seeded, a few have the corolla almost regular, and one or two have 5 stamens, either complete or incomplete. A large family, chiefly herbs, some shrubby, and one species is a small tree.

* *Tree, with large and opposite Catalpa-like leaves.*

1. PAULOWNIA. Calyx very downy, deeply 5-cleft. Corolla decurved, with a cylindrical or funnel-form tube, and an enlarged oblique border of 5 rounded lobes. Stamens 4, included. Pod turgid and top-shaped, filled with very numerous winged seeds.

* * *Herbs, or a few becoming low shrubs.*

\+ *Anther-bearing stamens* 5, *and a wheel-shaped or barely concave corolla.*

2. VERBASCUM. Flowers in a long terminal raceme or spike. Calyx 5-parted. Corolla with 5 broad and rounded only slightly unequal divisions. All the filaments or 3 of them woolly. Style expanding and flat at apex. Pod globular, many-seeded. Leaves alternate.

\+ \+ *Anther-bearing stamens only* 2 *or* 4.

++ *Flower with corolla wheel shaped, or at least with wide spreading border mostly much longer than the short tube; flowers single in the axils of the leaves or collected in a raceme or spike.*

3. CELSIA. Like Verbascum, but with only 4 stamens, those of 2 sorts.

4. ALONSOA. Calyx 5-parted. Corolla very unequal, turned upside down by the twisting of the pedicel, so that the much larger lower lobe appears to be the upper and the two short upper lobes the lower. Stamens 4. Pod many-seeded. Lower leaves opposite or in threes.

5. VERONICA. Calyx 4-parted, rarely 3–5-parted. Corolla wheel-shaped, or sometimes salver-shaped, with 4 or rarely 5 rounded lobes, one or two of them usually rather smaller. Stamens 2, with long slender filaments. Pod flat or flattish, 2-many-seeded. At least the lower leaves opposite or sometimes whorled.

++ ++ *Flower with corolla salver-shaped, with almost regular* 4 5-*lobed border; flowers in a terminal spike. Here one species of No.* 5 *might be sought.*

6. BUCHNERA. Calyx tubular, 5-toothed. Corolla with a slender tube, and the border cleft into 5 roundish divisions. Anthers 4 in 2 pairs, 1-celled. Style club-shaped at the apex. Pod many-seeded. Leaves mainly opposite, roughish.

++ ++ ++ *Flower with corolla either obviously* 2-*lipped, or funnel-form, tubular or bell-shaped.*

= *Corolla* 2-*parted nearly to the base, the* 2 *lips sac-shaped or the lower larger one slipper-shaped; stamens only* 2 (*or very rarely* 3), *and no rudiments of more.*

7. CALCEOLARIA. Calyx 4-parted. The two sac-shaped or slipper-shaped divisions of the corolla entire or nearly so. Pod many-seeded. Leaves chiefly opposite, and flowers in cymes or clusters.

= = *Corolla almost* 2-*parted, the middle lobe of the lower lip folded together to form a flat pocket which incloses the* 4 *stamens and the style.*

8. COLLINSIA. Calyx deeply 5-cleft. Corolla turned down, its short tube laterally flattened, strongly bulging on the upper side; upper lip 2-cleft and turned back; the lower one larger and 3-lobed, its middle and laterally flattened pocket-shaped lobe covered above by the two lateral ones. A little rudiment of the fifth stamen present. Pod globular, with few or several seeds. Flowers on pedicels single or mostly clustered in the axils of the upper opposite (rarely whorled) leaves, which are gradually reduced to bracts, forming an interrupted raceme.

= = = *Corolla not* 2-*parted nor salver-shaped, but with a tube of some length in proportion to the* 2-*lipped or more or less irregular* (*rarely nearly regular*) 4–5-*lobed border.*

‖ *A spur or sac-like projection at the base on the lower side, and a projecting palate to the lower lip, which commonly closes the throat or nearly so; stamens* 4, *and no obvious rudiment.*

9. LINARIA. Calyx 5-parted. Corolla personate, and with a spur at base. (Lessons, Fig. 258.) Pod many-seeded, opening by a hole or chink which forms below the summit of each cell.

10. ANTIRRHINUM. No spur, but a sac or gibbosity at the base of the personate corolla (Lessons, Fig. 257); otherwise like 9.

‖ ‖ *Neither spur nor sac at base of the corolla, nor a projecting palate in the throat, nor with the upper lip laterally compressed or folded and narrow and arched.*

○ *Stamens with anthers* 4, *and no rudiment of the fifth; peduncles* 1-*flowered.*

× *Plant climbing.*

11. MAURANDIA, including LOPHOSPERMUM. Herbs with alternate or partly opposite leaves, and solitary long-peduncled flowers in their axils, climbing by their coiling leafstalks and flowerstalks. Calyx 5-parted, foliaceous. Corolla open-mouthed, between bell-shaped and inflated-tubular, with 2 plaits or hairy lines running down the tube within, the border obscurely 2-lipped or oblique, but the 5 spreading roundish lobes nearly similar, the upper ones outermost in the bud. Pod as in 10.

× × *Plant not climbing (erect or trailing).*

\+ *Flowers (hanging) in a terminal showy raceme or spike.*

12. DIGITALIS. Herbs with erect simple stem and alternate leaves. Calyx 5-parted, foliaceous, the upper sepal smallest. Corolla declining, with a long more or less inflated tube and a short scarcely spreading border, distinctly or indistinctly lobed, the lower lobe or side longest, the lateral ones outermost in the bud. Pod 2-valved, many-seeded.

\+ + *Flowers axillary, and generally solitary.*

– *Upper lobes (or lips) of corolla covering the lower ones in the bud (except sometimes in No.* 13 *and perhaps in No.* 17.)

⌙ *Calyx prismatic.*

13. MIMULUS. Leaves opposite, with single flowers in the axils of the upper ones. Calyx with 5 projecting angles, 5-toothed. Corolla tubular or funnel-form, 2-lipped, the upper lip of 2 rounded and recurved lobes, the lower of 3 rounded spreading lobes. Stamens included. Stigma of 2 flat lips. Pod 2-valved, many-seeded.

14. TORENIA. Trailing herbs, with opposite leaves. Calyx with sharp angles, 2-lipped at summit, the lips 2-toothed and 3-toothed. Corolla short-funnel-shaped or tubular with inflated throat, 4-lobed, the upper lobe (sometimes slightly notched) outermost in the bud. Filaments arched and their anthers brought together in pairs under the upper lobe, the longer pair almost equaling the upper lobe and bearing a short naked branch or appendage at base; the shorter pair simple and included. Stigma 2-lipped. Pod many-seeded.

⌙⌙ *Calyx not prismatic.*

15. CONOBEA. Low branching herbs with opposite leaves and small whitish flowers. Calyx 5-parted, equal. Upper lip of short corolla 3-lobed and the lower 3-parted. Stigma 2-lobed.

16. HERPESTIS. Low rather succulent herbs with opposite leaves. Calyx 5-parted, but the upper division broader. Upper lip of the short corolla entire or notched or 2-cleft, the lower 3-lobed; or rarely the limb nearly equally 5-lobed. Style dilated or 2-lobed at the top.

17. LIMOSELLA. Creeping fleshy plants, with clustered entire leaves. Calyx 5-toothed and bell-shaped. Corolla short and small, open-bell-form, nearly regular and 5-cleft. Style short and club-shaped.

– – *Lower or lateral lobes of corolla covering the upper ones in the bud.*

18. GERARDIA. Herbs with branching stems, opposite or some alternate leaves, and above with single flowers in their axils or those of the bracts. Calyx 5-toothed or 5-cleft. Corolla inflated bell-shaped or tubular funnel-form, with an oblique or rather unequal border, the 5 lobes somewhat equal, the lower and lateral ones outside in the bud. Two pairs of stamens of quite unequal length. (Lessons, Fig. 263.) Pod globular or ovate, pointed, 2-valved, many-seeded.

19. SEYMERIA. Herbs, like 18; but corolla with a short and broad bell-shaped tube, not longer than the 5 ovate or oblong nearly equal spreading lobes; and the stamens almost equal, their anthers blunt at base.

○ ○ *Stamens with good anthers only* 2, *a pair of sterile ones or abortive filaments generally present also; flowers small; calyx* 5-*parted; corolla* 2-*lipped; leaves opposite, with single flowers in the axil of the upper ones; peduncles simple and bractless.*

20. ILYSANTHES. Spreading little herbs. Upper lip of the short corolla erect and 2-lobed; the lower larger, spreading, 3-cleft. Upper pair of stamens with good anthers, included in the tube of the corolla; lower pair borne in the throat and protruded, 2-forked, without anthers. Stigma 2-lipped. Pod many-seeded.

21. GRATIOLA. Low herbs. Upper lip of the corolla either entire or 2-cleft; lower 3-cleft. Stamens included; the upper pair with good anthers; the lower pair short, with rudiment of anthers or a mere naked filament, or none at all. Stigma 2-lipped. Pod many-seeded. A pair of bracts at the base of the calyx.

○ ○ ○ *Stamens with anthers* 4, *the fifth stamen present as a barren filament or a scale; calyx* 5-*parted or of* 5 *imbricated sepals; stigma simple; leaves chiefly opposite; flowers in the axils of the upper leaves, or when these are reduced to bracts forming a terminal panicle or raceme; peduncles few-flowered, or when one-flowered bearing a pair of bractlets, from the axils of which flowers may spring; pod many-seeded.*

× *Rudiment of the fifth stamen a little scale at the summit of the tube of the corolla.*

22. SCROPHULARIA. Homely and rank erect herbs. Corolla small, with a globular or oval tube, and a short border composed of 4 short erect lobes and one (the lower) spreading or reflexed. Fertile stamens short and included.

× × *Rudiment an evident filament.*

23. CHELONE. Low upright smooth herbs, with flowers sessile in spikes or clusters in the axils of the upper leaves, and accompanied by closely imbricated concave roundish bracts and bractlets. Corolla short-tubular and inflated, concave underneath, with the 2 broad lips only slightly open; the upper arched, keeled in the middle, notched at the apex; the lower one woolly bearded in the throat and 3-lobed at the end. Filaments and anthers woolly; sterile filament shorter than the others. Seeds winged.

24. PENTSTEMON. Herbs (or a few shrubby at base), with mostly upright stems branching only from the base, and panicled or almost racemed flowers. Corolla tubular, bell-shaped, funnel-form, etc., more or less 2-lipped, open-mouthed. Sterile filament conspicuous, usually about as long as the anther-bearing ones. (Lessons, Fig. 264.) Seeds wingless.

25. RUSSELLIA. Rather shrubby spreading plants, or with pendulous angular branches; the flowers loosely panicled or racemed. Corolla tubular with 5 short spreading lobes, the 2 upper a little more united. Sterile filament small and inconspicuous near the base of the corolla. Seeds wingless.

‖ ‖ ‖ *Neither spur nor sac at base of the corolla, the narrow laterally compressed or infolded upper lip of which is helmet-shaped or arched, entire or minutely notched, and inclosing the* 4 *stamens; no sterile filament. Often showy but uncultivable plants.*

○ *Cells of the anther unequal.*

26. CASTILLEIA. Herbs with simple stems, alternate leaves, some of the upper, with flowers chiefly sessile in their axils, colored like petals, and more gay than the corollas. Calyx tubular, flattened laterally, 2-4-cleft. Corolla tubular, with a long and narrow conduplicate erect upper lip, and a very short 3-lobed lower lip. Pod many-seeded.

○ ○ *Cells of the anther equal.*

27. SCHWALBEA. Upright simple and leafy-stemmed herb, with a loose spike of rather showy dull purplish or yellowish flowers and alternate sessile and entire leaves. Calyx oblique and tubular, 10–12-ribbed and 5-toothed, the teeth unequal. Upper lip of corolla oblong and entire. Pod many-seeded.

28. PEDICULARIS. Herbs with simple stems, chiefly pinnatifid leaves and spiked flowers. Corolla tubular, with a strongly arched or flattened helmet-shaped upper lip, and the lower erect at base, 2-crested above and 3-lobed. Seeds several in each cell.

29. MELAMPYRUM. Low herbs with branching stems, opposite leaves, and flowers in their axils, or the upper crowded in a bracted spike. Calyx bell-shaped, 4-cleft, the lobes taper-pointed. Corolla tubular, enlarging above, with the lower lip nearly equaling the narrow upper one and its biconvex palate appressed to it, 3-lobed at the summit. Cells of the anther minutely pointed at base. Pod oblique, with only 2 seeds in each cell.

1. PAULÒWNIA. (Named for *Anna Paulowna*, a Russian Princess.)

P. imperiàlis, Sieb. & Zucc. Cult. for ornament, from Japan and China. Scarcely hardy far N.; the heart-shaped very ample leaves resembling those of Catalpa, but much more downy; flowers in large terminal panicles, in spring, the violet corolla $1\frac{1}{2}'$–$2'$ long.

2. VERBÁSCUM, MULLEIN. (Ancient Latin name.) Natives of the Old World, here weeds. 2*l* ②

V. Thápsus, Linn. COMMON M. Fields; densely woolly, the tall simple stem winged from the bases of the oblong leaves, bearing a long, dense spike of yellow (rarely white) flowers.

V. Lychnìtis, Linn. WHITE M. Waste places, rather scarce; whitened with thin, powdery woolliness, the stem not winged, ovate leaves greenish above, and spikes of yellow or rarely white flowers panicled.

V. Blattària, Linn. MOTH M. Roadsides; green and smoothish, 2°–3° high, slender, with ovate toothed or sometimes cut leaves, and loose raceme of yellow or white and purplish-tinged flowers.

3. CÉLSIA. (Named for *O. Celsius*, a Swedish Orientalist.) Flowers summer.

C. Crètica, Linn. f. Cult. for ornament from the Mediterranean region; 2°–3° high, rather hairy, or the raceme clammy, with lower leaves pinnatifid, upper toothed and clasping at base; corolla orange-yellow with some purple ($1'$–$2'$ across); lower pair of filaments naked, the upper pair short and woolly-bearded. ②

4. ALONSÒA. (Named for *Alonzo Zanoni*, a Spanish botanist.) Cult. as annuals, from S. Amer.; flowers all summer. Commonest one is

A. incisifòlia, Ruiz & Pav. (also called A. URTICÆFÒLIA). Smoothish, branching, 1°–2° high, with lance-ovate or oblong sharply cut-toothed leaves, and orange-scarlet corolla less than $1'$ wide; several varieties.

5. VERÓNICA, SPEEDWELL. (Name of doubtful derivation, perhaps referring to *St. Veronica*.) Flowers summer.

* *Shrubby, tender, very leafy species from New Zealand, with entire and glossy smooth and nearly sessile evergreen leaves, all opposite, dense many-flowered racemes from the axils, and acutish pods.*

V. speciòsa, R. Cunn. Smooth throughout, with obovate or oblong blunt or retuse thick leaves, and very dense spike-like racemes of violet-purple flowers.

V. salicifòlia, Forst. Leaves lanceolate acute, and longer; clammy-pubescent racemes of blue flowers.

* * *Herbs, growing wild, or those of the first subdivision (+–) cultivated in gardens.*

+– *Spikes or dense spike-like racemes terminating the erect stem or branches and often clustered.* 2l

V. spicàta, Linn. Erect from a spreading base, 1°–2° high, with opposite or whorled leaves which are narrow-oblong or oblanceolate and serrate, petiolate; flowers bright blue, the tube shorter than the calyx; stamens long-exserted. Eu.

V. paniculàta, Linn. (V. AMETHÝSTINA). Mostly taller; leaves opposite or in 3's, lanceolate and acute, crenate-serrate or jagged, narrow at base and petiolate or sub-sessile; flowers blue in long, loose spikes or racemes. Eu.

V. longifòlia, Linn. The form in cult. as var. SUBSÉSSILIS, from Japan, has ovate leaves sessile or nearly so, which are sharply toothed and broad at the base; flowers very many in long, erect or spreading spikes, clear blue.

V. Virgínica, Linn. CULVER'S ROOT. Wild in rich woods from Vt., W. and S.; remarkable for the tube of the small whitish corolla longer than the acutish lobes, and much longer than the calyx; simple stems 2°–6° high, bearing whorls of lanceolate or lance-ovate pointed finely serrate leaves; spikes dense and clustered.

+– +– *Racemes in the axils of the opposite leaves; stems creeping or procumbent at base, but above ascending; corolla, as in all the following, strictly wheel-shaped.* 2l

++ WATER SPEEDWELLS OR BROOKLIME, *in water or wet ground, smooth and with pale blue (sometimes darker striped) flowers on slender spreading pedicels.*

= *Pod turgid.*

V. Anagállis, Linn. In water N.; leaves lance-ovate acute, sessile by a heart-shaped base, 2′–3′ long; pod slightly notched, many-seeded.

V. Americàna, Schw. In brooks and ditches; leaves mostly petioled, ovate or oblong, serrate; flowers on more slender pedicels, and pod more turgid than in the foregoing.

= = *Pod strongly flattened.*

V. scutellàta, Linn. In bogs N.; slender, with linear slightly toothed sessile leaves, only 1 or 2 very slender zigzag racemes, few long-pediceled pale flowers; and pod deeply notched at both ends, broader than long, few-seeded.

++ ++ *In dry ground, pubescent, with light blue flowers in spike-like racemes.*

V. officinàlis, Linn. COMMON SPEEDWELL. Spreading or creeping, low; leaves wedge-oblong or obovate, serrate, short-petioled; pedicels shorter than calyx; pod wedge-obcordate, several-seeded. N. Eng., W. and S.

+– +– +– *Raceme loose, terminating the leafy low stem or branches, or the small flowers in the axils of the gradually decreasing leaves.*

++ 2l *Flowers in a terminal raceme.*

V. serpyllifòlia, Linn. Creeping or spreading on the ground; with simple flowering stems ascending 2′–4′, smooth; leaves roundish, small almost entire; corolla pale blue or whitish with darker stripes, longer than the calyx. Fields and roadsides.

++ ++ ① *Flowers axillary and mostly alternate along the stem.*

V. peregrìna, Linn. NECKWEED or PURSLANE S. Common weed in damp waste or cult. ground; smooth, erect, branching, with lower leaves oval or oblong and toothed, the upper oblong-linear and entire, inconspicuous flowers almost sessile in their axils, whitish corolla shorter than the calyx, and many-seeded pod slightly notched.

V. arvénsis, Linn. CORN S. Introduced into waste and cult. grounds E.; hairy, 3′–8′ high, with lower leaves ovate and crenate, on petioles, the upper sessile lanceolate and entire, blue flowers short-peduncled, and pod obcordate. Eu.

6. BÚCHNERA, BLUE HEARTS. (*J. G. Buchner*, an early German botanist.) Flowers summer. 2

B. Americàna, Linn. Rough-hairy, turning blackish in drying; with slender stem 1°–2½° high, veiny leaves coarsely few-toothed, the lowest obovate, middle ones oblong, uppermost lance-linear; flowers scattered in the slender spike, and corolla deep purple. Sandy or gravelly plains, from N. Y., W. and S.

7. CALCEOLÀRIA. (Latin *calceolus*, a shoe or slipper.) Tender South American herbs or shrubs, with curious and handsome flowers, cult. as house and bedding plants. The common cultivated species are now much mixed.

C. integrifòlia, Murr. (also called C. RUGÒSA and C. SALVIÆFÒLIA) is the commonest woody-stemmed species, with oblong leaves rugose in the manner of garden Sage, and small yellow or orange flowers in crowded clusters.

C. corymbòsa, Ruiz & Pav. Herbaceous, hairy or clammy-pubescent, with ovate crenate-toothed leaves nearly all at the root, and loose corymbs or cymes of yellow flowers, the purple-spotted mouth considerably open.

C. crenatiflòra, Cav. Parent of many of the more showy herbaceous garden forms, with more leafy stems and larger flowers, their orifice rounder and smaller, the hanging lower lip or sac 1′ or more long, more obovate and flat, somewhat 3-lobed as it were towards the end, and variously spotted with purple, brown, or crimson.

C. scabiosæfòlia, Sims. Delicate annual, with pinnately divided, slightly hairy leaves, on petioles dilated and connate at base, and loose, small, pale yellow flowers with globular lower lip about ½′ wide.

8. COLLÍNSIA. (*Zaccheus Collins* of Philadelphia.) Flowers handsome, mostly 2-colored. ① ②

* *Pedicels longer than the calyx.*

C. vérna, Nutt. Wild from W. N. Y., W. and cult.; slender, 6′–20 high, with ovate or lance-ovate and toothed leaves, the upper clasping heart-shaped, and slender-peduncled flowers in early spring, lower lip blue, upper white; gibbous throat of corolla shorter than the limb; pedicels longer than the flowers.

C. grandiflòra, Dougl. From Pacific coast; saccate throat of corolla as long as the upper lip, which is white or purple; lower lip deep blue; pedicels about the length of the flower, the latter showy and ¾′ long.

* * *Pedicels shorter than the calyx.*

C. bícolor, Benth. California; a handsome garden annual, is stout, with crowded flowers as if whorled, pedicels shorter than calyx, lower lip of corolla violet, the upper pale or white, or in one variety both white.

9. LINÀRIA, TOADFLAX. (From *Linum*, Flax, from resemblance in the leaves of the commoner species.) Flowers summer.

* *Leaves narrow, sessile, and entire; stems erect; flowers racemed.*

← *Flowers yellow.*

L. vulgàris, Mill. Common T., Ramsted, Butter and Eggs. A showy but troublesome European weed, of fields and roadsides, 1°–3° high, with alternate crowded linear or lanceolate pale leaves, and a dense raceme of flowers 1′ long with paler tips. 2ℓ (Lessons, Fig. 258.)

← ← *Flowers blue or violet.*

L. Canadénsis, Dumont. Wild T. Gravelly and sandy ground, with scattered, linear leaves on the slender, flowering stems, or oblong and in pairs or threes on prostrate shoots, and very small, blue flowers. ① ②

L. triornithóphora, Willd. Cult. from Eu.; glaucous, 2°–3° high, with ovate-lanceolate leaves in whorls, and rather large, slender-peduncled, long-spurred flowers, violet and purple-striped. 2ℓ

* * *Leaves broad, often lobed; stems and branches trailing; flowers very small, yellow and purple mixed, on long axillary pedicels; natives of Eu.*

L. Elátine, Mill. Nat. in gravelly or sandy soil; hairy, with ovate and halberd-shaped, short-petioled leaves, the lower ones opposite. ①

L. Cymbalària, Mill. Kenilworth Ivy. Cult. as a delicate little trailing ornamental plant; very smooth, pale, with rooting branches, and thickish almost kidney-shaped 3–5-lobed leaves on long petioles. 2ℓ

10. ANTIRRHÌNUM, SNAPDRAGON. (Name Greek, compares the flower with the snout or muzzle of an animal.) Flowers summer. (Lessons, Fig. 257.)

§ 1. True Snapdragon, *with palate closing the mouth of the corolla, and erect or ascending stems, not climbing. Nat. and cult. from Eu.*

A. màjus, Linn. Large S., of the gardens; with stems 1°–3° high, oblong or lanceolate entire, smooth leaves, and glandular-downy raceme of showy flowers, the crimson, purple, white, or variegated corolla over 1′ long. 2ℓ

A. Oróntium, Linn. Small S. Weed in some old gardens and cult. grounds; low, slender, with linear leaves, and white or purplish axillary flowers ½′ long. ①

§ 2. Maurandia-like S., *with palate not so large, nor fully closing the mouth, and stems climbing by the coiling of their slender petioles, and sometimes of the peduncles also.*

A. maurandioìdes, Gray. Cult. from Texas and Mexico, generally as Maurándia antirrhiniflòra; smooth, with triangular-halberd-shaped leaves, or some of them heart-shaped, and showy flowers in their axils, the violet or purple corolla 1′ or more long. 2ℓ

11. MAURÁNDIA. (Named for *Prof. Maurandy.*) Excluding the last preceding species, which has the flower of Snapdragon, and including Lophospermum, which has wing-margined seeds. Mexican climbers, with triangular and heart-shaped or halberd-shaped and obscurely lobed leaves, tender, cult. for ornament; flowers all summer.

* *Corolla naked inside, rather obviously 2-lipped.*

M. Barclayàna, Lindl. Stems and leaves smooth; calyx glandular-hairy, clammy, its divisions lance-linear; corolla purple, usually dark, 2′ or more long.

M. semperflòrens, Ortega. Has lanceolate, smooth calyx divisions, and smaller rose-purple or violet corolla.

* * *Corolla very obscurely 2-lipped, and with 2 bearded lines.* (LOPHOSPÉRMUM.)

M. erubéscens, Gray. Somewhat soft-pubescent, with irregularly toothed leaves, rose-colored flowers 3′ long, and ovate-oblong, rather leaf-like sepals.

M. scándens. Gray. Less common and not so showy, is less pubescent, and has smaller, less-inflated, deeper purple corolla, and lance-oblong sepals.

12. DIGITÀLIS, FOXGLOVE. (Latin name, from shape of the corolla, likened to the finger of a glove, in the common species.)

D. purpùrea, Linn. Corolla ranging from purple to white, and more or less strongly spotted, 2′ long, the lobes rather obscure; leaves rugose, somewhat downy. Strong plants 2°–3°, and declined flowers. Cult. from Eu.; flowers summer. 2

13. MÍMULUS, MONKEY FLOWER. (From Greek for *an ape*, or *buffoon*, from the grinning corolla.) Flowers all summer.

* *Wild in wet places, with erect (except in the third) square stem* 1°–2° *high, oblong or roundish feather-veined serrate leaves.* 2

+ *Flowers violet or purple.*

M. ringens, Linn. Leaves clasping; peduncles longer than the flower; calyx teeth taper-pointed. Wet places, common.

M. alàtus, Ait. Leaves tapering into a petiole; peduncle shorter than the calyx and short-toothed, and sharp wing-like angles to stem. N. Eng. to Ill., and S.

+ + *Flowers yellow.*

M. Jamèsii, Torr. & Gray. Diffuse, nearly or quite smooth, somewhat creeping plant, in springy places in Mich. and Minn., and S. W.; stem leaves nearly sessile, and roundish or kidney-form.

* * *Cult. for ornament, chiefly in conservatories, from W. N. Amer.*

+ *Plant not glutinous, smooth.*

M. lùteus, Linn. Erect; leaves ovate or cordate-clasping, several-nerved; flowers showy, yellow, often spotted with rose or brown; of many varieties, and common in cultivation.

+ + *Plant glutinous or clammy.*

M. moschàtus, Dougl. MUSK PLANT. Weak and diffuse, rooting, clammy-villous, smelling strongly of musk; leaves ovate or oblong; flower small, pale yellow. 2

M. cardinàlis, Dougl. Erect, clammy-pubescent; leaves wedge-oblong, partly clasping, several-nerved; flowers large, brick-red. 2

M. glutinòsus. Wendl. Shrubby conservatory plant from Cal., glutinous-pubescent, with oblong or lanceolate leaves, and large yellow, orange, or brick-red flower.

14. TORÈNIA. (*Olef Toren*, a Swedish botanist.)

* *Calyx wing-angled.*

T. Asiática, Linn. Cult. from India; a handsome hothouse plant, with flowers in sub-umbellate clusters, and lance-ovate, serrate leaves, and

corolla over 1′ long, pale violet or purple, with the tube and the end of the 3 rounded lower lobes dark violet; longer filaments toothed at the base.

T. Fournièri, Linden. Flowers racemose or scattered, the tube pale violet and yellow on the back, the upper lip lilac and slightly 2-lobed, the lower lip bright violet and 3-lobed, the central lobe with a yellow blotch at the base; no tooth at base of the longer filaments; leaves ovate-cordate and serrate. Cochinchina.

* * *Calyx not wing-angled.*

T. flàva, Hamilt. (T. Baillòni). Flowers axillary, in pairs; corolla yellow with a purple eye. India.

15. CONÒBEA. (Name obscure.) ①

C. multífida, Benth. A diffusely spreading, minutely pubescent, low herb, growing along shores Ohio, W.; leaves opposite, and pinnately parted, the divisions linear-wedge-form; corolla greenish-white, and scarcely longer than the calyx.

16. HERPÈSTIS. (Greek: *a creeping thing*, alluding to the procumbent habit.) 2

* *Flower plainly 2-lipped.*

H. nigréscens, Benth. Very leafy, glabrous, erect or nearly so; leaves oblong or lance-wedge-form, serrate, the upper ones mostly shorter than the pedicels; corolla whitish or purplish. Wet places, Md., S.

H. rotundifòlia, Pursh. Creeping and nearly smooth; leaves round-obovate and partly clasping; peduncles only 2 or 3 times the length of the calyx; corolla white or pale blue. Pond margins, Ill. to Minn., and S.

H. amplexicaùlis, Pursh. Creeping at base, hairy; leaves ovate and clasping; peduncles shorter than the calyx; corolla blue. Pine barrens, N. J., S.

* * *Corolla almost regular.*

H. Monnièra, HBK. Creeping and glabrous; leaves wedge-obovate or spatulate, sessile; corolla pale plue. Md., S., near the ocean.

17. LIMOSÉLLA, MUDWORT. (Latin: *mud* and *seat*.) ①

L. aquática, Linn., var. **tenuifòlia**, Hoffm. A creeping little plant, with small white or purplish flowers on simple, naked peduncles; leaves thread-like or awl-form. Brackish places, N. J., N.; also far N. W.

18. GERÁRDIA. (The herbalist, *John Gerarde*.) Handsome, but mostly uncultivable plants (often partially parasitic on roots of other plants; Lessons, Fig. 89); flowers late summer and autumn. The following are the commonest wild species.

* *Corolla yellow and with a long tube, the inside woolly, as are the filaments and anthers; the latter almost projecting, slender-pointed at base; calyx 5-cleft; tall herbs, with leaves or some of them pinnatifid or toothed.* 2 *except the first.*

+ *Hairy or pubescent.*

++ *Pubescence partly glandular and viscid.*

G. pediculària, Linn. Slightly pubescent; 2°–3° high, very leafy; leaves all pinnatifid and the lobes cut-toothed; pedicels opposite, and longer than the hairy serrate calyx lobes; corolla over 1′ long. N. Eng., S. and W. ① ②

Var. **pectinàta**, Nutt. Sandy barrens, N. Car., S.; more hairy than the foregoing, with finer divided leaves, alternate pedicels shorter than pinnatifid calyx lobes; corolla broader and $1\frac{1}{2}'$ long.

++ ++ Pubescence not glandular.

G. grandiflòra, Benth. Oak openings from Wis. and Minn., S.; stems bushy-branched, 3°–4° high, minutely downy; leaves ovate-lanceolate, coarsely cut-toothed, the lower pinnatifid; pedicels shorter than the barely toothed calyx lobes; corolla 2′ long.

G. flàva, Linn. 3°–4° high, minutely soft-downy; upper leaves lanceolate or oblong and entire, lower sinuate or pinnatifid; pedicels very short; flowers in a leafy raceme; stems nearly simple; corolla $1\frac{1}{2}'$ long. Open woods, N. Eng., W. and S.

+- +- Plant glabrous.

G. quercifòlia, Pursh. Rich woods, N. Eng., S. and W.; 3°–6° high, smooth and glaucous; upper leaves often entire, lower once or twice pinnatifid; pedicels as long as calyx; corolla 2′ long.

G. lævigàta, Raf. Barrens, from Penn., S. and W.; 1°–2° high, smooth, not glaucous; leaves lanceolate, entire; corolla 1′ long.

* * *Corolla purple (or sometimes white) naked within; calyx deeply and unequally 5-cleft; anthers pointless, those of the shorter pair much smaller; leaves rather broad.* ①

G. auriculàta, Michx. Low grounds, from Penn. S. and W.; rough-hairy, with nearly simple stem, lanceolate or oblong leaves entire, or the lower with a lobe on each side of the base; flowers sessile in the upper axils; corolla 1′ long.

* * * *Corolla purple or rose-color, somewhat bell-shaped; calyx teeth short; anthers all alike, nearly pointless at base; leaves narrow, linear or thread-shaped, entire; loosely branching.*

+- Stems with prominent leaves.

++ ♃ Pedicels erect, as long as the floral leaves.

G. linifòlia, Nutt. Pine barrens, Del., S.; with erect branches, and erect linear leaves about the length of the peduncles, truncate calyx, and corolla 1′ long.

++ ++ ① Pedicels little, if any, longer than the calyx.

G. purpùrea, Linn. Pedicels stout; calyx conspicuously 5-lobed; leaves opposite and spreading; rather broad linear corolla $\frac{3}{4}'$–1′ long. Low grounds near sea coast and Great Lakes. Variable.

G. marítima, Raf. Salt marshes N. and S.; lower than the preceding, and with fleshy blunt leaves; calyx obtusely 5-toothed; corolla $\frac{1}{2}'$–$\frac{3}{4}'$ long.

++ ++ ++ ① Pedicels equaling or exceeding the corolla.

G. tenuifòlia, Vahl. Pedicels opposite, equaling the linear spreading leaves; calyx-teeth broadly awl-shaped; corolla $\frac{1}{2}'$–$\frac{3}{4}'$ long. Common.

G. filifòlia, Nutt. With alternate pedicels twice the length of the rather fleshy, thread-shaped or slightly club-shaped fascicled leaves; corolla $\frac{3}{4}'$ long. Barrens, Ga., S.

+- +- Stems with minute scales in place of leaves.

G. aphýlla, Nutt. Pedicels short, alternate along one side of the flowering branches, and minute scale-like or awl-shaped appressed leaves, minute calyx teeth, and corolla $\frac{1}{2}'$ long. Barrens, N. Car., S. ①

19. SEYMÈRIA. (*Henry Seymer*, an English naturalist.) Wild plants S. and W., very like Gerardia; flowers yellow, in summer and autumn.

* *Stems much branched; corolla glabrous within (except at base of stamens).* ①

S. pectinàta, Pursh. About 1° high, branchy, clammy-pubescent; pinnatifid leaves with oblong-linear lobes; corolla ½′ long. Dry soil, N. Car., S.

S. tenuifòlia, Pursh. Low sandy grounds, N. Car., S.; 2°–4° high, with long, slender branches; leaves pinnately divided into thread-shaped divisions; corolla hardly ½′ long.

* * *Stems nearly simple; corolla densely woolly within.* 2

S. macrophýlla, Nutt. MULLEIN FOXGLOVE. Shady river banks Ohio, W.; 4°–5° high, with large leaves, twice or thrice pinnately divided or cut, the upper lanceolate and toothed; corolla curved; style short.

20. ILYSÁNTHES, FALSE PIMPERNEL. (Greek: *mire* and *flower*, alluding to the station.) Flowers all summer.

I. ripària, Raf. Common in wet places; a smooth diffuse little plant, 4′–8′ high, with rounded or oblong leaves, and small purple or blush flowers. ①

21. GRATÌOLA, HEDGE HYSSOP. (Old name, from Latin *gratia*, grace, alluding to supposed medicinal properties.) Rather insignificant plants, in low or wet places; flowering all summer. ① 2

* *Stems generally diffusely branched, sometimes creeping at the base.*

– *Sterile filaments minute or hardly any; corolla whitish, with yellowish tube.*

G. Virginiàna, Linn. Rather clammy, with lanceolate leaves and slender peduncles. Common.

G. sphærocárpa, Ell. Smooth and stouter, with lance-ovate leaves; peduncles scarcely longer than the calyx, and larger spherical pod. N. J. to Ill., and S.

– – *Sterile filaments obvious, usually tipped with a little glandular head in place of the anther; leaves short.*

G. viscòsa, Schw. Clammy, with lance-oblong toothed leaves, shorter than the peduncles, and whitish flowers. Ky., S.

G. aùrea, Muhl. Sandy wet soil, Vt. to Ohio and S.; nearly smooth, with rather narrow entire leaves as long as the peduncles, and golden yellow flowers.

* * *Stems mostly simple and strict.*

G. pilòsa, Michx. Very different from any of the foregoing, having rigid and erect stems, and ovate or oblong sessile leaves, both hairy, the flowers sessile, the white corolla hardly longer than the calyx. Low ground, N. J., S.

22. SCROPHULÀRIA. FIGWORT. (Plants a supposed remedy for *scrofula*.) Homely and insignificant plants.

S. nodòsa, Linn., var. **Marilándica**, Gray. Damp, shady ground; smooth, with 4-sided stem 3°–4° high, ovate or oblong coarsely toothed leaves, and small lurid flowers in loose cymes, all summer. 2

23. **CHELÒNE**, TURTLEHEAD (to which the name, from the Greek, refers), SNAKEHEAD, BALMONY. 2

C. glàbra, Linn. The common species, of wet places; 1°–2° high, strict, with lanceolate or lance-oblong, appressed-serrate leaves on very short petioles, and white or rose-tinged corolla 1′ or more long; bracts not ciliate.

C. oblìqua, Linn. Looser, with spreading branches; leaves broad-lanceolate or oblong, deeply serrate; bracts ciliolate; corolla deep rose-color. Va. to Ill., and S.

24. **PENTSTÈMON.** (Greek: meaning 5 *stamens;* refers to the presence of the 5th stamen, which, however, has no anther.) Showy North American and a few Mexican plants, chiefly Western; two or three are wild E.; several are in cultivation. Flowers late spring and summer. 2

* *Plant more or less pubescent or viscid-glandular, at least above (rarely glabrous in the last); often glabrous below.*

+ *Corolla white, or only purplish-tinged.*

P. lævigàtus, Soland. Inflorescence pubescent, but plant (2°–4°) glabrous below; leaves nearly entire, ovate-lanceolate or somewhat oblong, glossy, firm, the base clasping; corolla abruptly and broadly inflated, the throat wide and open; sterile filament with a thin beard above. Rich soil, Penn., W. and S.

Var. **Digitàlis**, Gray. Is generally taller (often 5°) with a larger and purer white corolla which is more abruptly inflated. Penn., W.

+ + *Corolla purple, blue or yellow (rarely whitish in the first).*

++ *Flowers glabrous within.*

P. Cobæa, Nutt. Plains from Kan., S.; 1°–2° high, stout, with ovate often denticulate thick leaves, a slightly clammy, few-flowered panicle or raceme, pale purplish or whitish corolla about 2′ long and abruptly much inflated above the narrow base, the border 2-lipped, but the oblong lobes similar; the sterile filament bearded. Cult.

++ ++ *Flowers bearded within.*

P. ovàtus, Dougl. Ore.; an early blue-flowered species, puberulent or pubescent, with ovate or lance-ovate serrate leaves, and open panicle of small flowers.

P. pubéscens, Soland. Somewhat clammy-pubescent, or smoothish except the panicle, 1°–3° high, variable; stem leaves lanceolate; flowers nodding, blush commonly tinged with some purplish or violet; the plainly 2-lipped corolla (1′ long) with gradually enlarging tube concave on the lower, convex on the upper side, a sort of palate almost closing the mouth; sterile filament yellow-bearded down one side. Dry soil. Common. (Lessons, Fig. 297.)

P. confértus, Dougl. Sometimes glabrous throughout; 1°–2°, with oblong or lance-oblong or even linear, nearly or quite entire leaves; inflorescence spike-like, interrupted and naked; corolla small, cream-color or sulphur-color, or in

Var. *cærùleo-purpùreus*, Gray, blue-purple and violet. Rocky Mountains and W.

* * *Plant smooth throughout, often glaucous.*

+ *Leaves sharply serrate.*

P. campanulàtus, Willd. Leaves lanceolate, acuminate, the base clasping; flowers in a raceme-like, one-sided panicle; corolla ventricose above, reddish-purple or rose-colored; sterile filament bearded. Common in gardens, and varies greatly in cultivation. Mexico.

+ + Leaves entire or very nearly so.

++ Corolla strongly bilabiate.

P. barbàtus, Nutt. Mexico (wild N. to Col.), long cult. in the gardens; slender, wand-like stems, 3°–4° high, lanceolate and entire, pale leaves, long and loose raceme or panicle of drooping flowers, narrow tubular scarlet corolla over 1′ long, with erect upper lip concave and slightly 2-lobed, the lower parted into 3 reflexed or spreading oblong lobes, some beard in the throat, and sterile filament naked.

++ ++ Corolla obscurely 2-lipped.

P. grandiflòrus, Nutt. Pale and glaucous, 1°–3° high, with thick ovate leaves (1′–2′ long), closely sessile and entire, the upper ones rounded, short-pediceled flowers racemed, lilac-purple, oblong-bell-shaped corolla 1½′–2′ long, and almost equally 5-lobed, the sterile filament nearly smooth. Wis., W. and S. (Lessons, Fig. 264.)

P. glàber, Pursh. Plains from Dak., S. and W.; commonly pale or glaucous, with ascending stems 1°–2° long; lanceolate or lance-ovate, entire leaves, and a narrow panicle of very handsome flowers; the tubular-inflated corolla about 1½′ long, bright purple-blue, with the spreading lobes of the 2 short lips similar; sterile filaments and also the anthers slightly hairy or else naked.

P. Hartwégi, Benth. (P. GENTIANOÏDES). Leaves lanceolate, entire, the upper broader at the base and clasping; peduncles elongated, 3-flowered; corolla 2′ long, deep-red or red-purple, the border almost equally 5-cleft; sterile filament naked. Mexico. Long cultivated.

25. RUSSÉLLIA. (Named for *Dr. Alexander Russell* of Scotland.) 2ℓ

R. júncea, Zucc. A showy house and bedding plant; very smooth, with leaves small lance-ovate or linear, or else reduced to little scales on the copious, long, and rush-like, green, hanging branches and branchlets; corolla 1′ long, narrow, bright carmine red. Mexico.

26. CASTILLÈIA, PAINTED CUP. (Named for *Castillejo*, a Spanish botanist.) There are several showy species on the plains from beyond the Mississippi to the Pacific. Flowers all late spring and summer. Root-parasites.

C. coccínea, Spreng. SCARLET P. Sandy low grounds; pubescent, simple-stemmed, 1°–2° high, with stem leaves cut-lobed, those next the flowers 3-cleft, their dilated and cut-toothed lobes brilliant scarlet, while the 2-cleft calyx is yellowish, and the narrow corolla pale yellow. ① ②

27. SCHWÁLBEA, CHAFF-SEED. (*C. G. Schwalbe*, a German botanist.) 2ℓ

S. Americàna, Linn. Minutely pubescent, upright, 1°–2°, with simple leafy stems and a loose spike of rather showy purplish-yellow flowers; leaves alternate and sessile, 3-nerved and entire, ovate or oblong. Sandy wet soil, near the coast, Mass., S.

28. PEDICULÀRIS, LOUSEWORT (which the name denotes). 2ℓ

P. Canadénsis, Linn. COMMON P. or WOOD BETONY. Low, rather hairy, with alternate leaves, the upper pinnatifid, lower pinnate; a short dense spike of greenish and purplish flowers; oblique calyx without lobes, but split down in front, and a dagger-shaped pod; flowers spring. Dry woods and banks.

P. lanceolàta, Michx. Less common in swamps; 1°–3° high, smoothish, with lance-oblong leaves doubly cut-toothed, some of them opposite; a close spike of pale yellow flowers; 2-lobed leafy-crested calyx, and ovate pod; flowers late summer.

29. MELAMPŸRUM, COWWHEAT. (Greek: *black grain*, from the color of the seeds.) ①

M. Americànum, Michx. Our only species, common in open woodlands; 6′–12′ high, with lanceolate leaves, the upper ones abrupt or truncate at base and with a few bristle-tipped teeth, the scattered flowers pale-yellowish or almost white, sometimes purplish-tinged, produced all summer.

LXXXII. OROBANCHACEÆ, BROOM RAPE FAMILY.

Low, root-parasitic perennials, destitute of green herbage, and with yellowish or brownish scales in place of leaves, the monopetalous corolla (withering and persistent) more or less 2-lipped or irregular, 4 didynamous stamens, and 1-celled ovary and pod, with the 2 or 4 parietal placentæ covered with innumerable small seeds. Ours occur in woods, and are mostly parasitic on the roots of trees.

* *Flowers of two sorts scattered on slender branches.*

1. EPIPHEGUS. Stems slender and bushy-branching, with small and scattered scales and flowers scattered in loose spikes or racemes, with minute bracts. Upper flowers conspicuous, but seldom ripening fruit, with tubular 4-toothed corolla, and long filaments and style; lower flowers small and short, seldom opening, but fertilized in the bud.

* * *Flowers all perfect and alike.*

2. CONOPHOLIS. Stems thick, covered with firm overlapping scales, each of the upper ones with a flower in its axil, forming a spike. Calyx 4–5-toothed, and split down on the lower side. Corolla short, strongly 2-lipped; upper lip arched and notched; lower one spreading and 3-cleft. Stamens protruding.
3. APHYLLON. Stems are chiefly slender 1-flowered scapes from a scaly mostly subterranean base. Calyx 5-cleft. Corolla with a long curved tube, and a spreading slightly 2-lipped or irregular 5-lobed border; the lobes all nearly alike. Stamens included in the tube.

1. EPIPHÈGUS, BEECH DROPS, CANCER ROOT. (Greek: *on the Beech*, the plant chiefly found parasitic on the roots of that tree.) One species.

E. Virginiàna, Bart. About 1° high, with purplish flowers ½′ or more long, in late summer and autumn. Rather common in woods, but overlooked because of the brown color of the plant.

2. CONÓPHOLIS, SQUAWROOT, CANCER ROOT. (Greek for *cone scale*, the plant having the aspect of a slender fir cone when old.)

C. Americàna, Wallr. Not widely common, in oak woods, forming clusters among fallen leaves, 3′–6′ high, as thick as the thumb, yellowish; flowers early summer.

3. APHÝLLON, NAKED BROOM RAPE or ONE-FLOWERED CANCER ROOT. (Greek: *without leaves.*) Flowers spring and early summer.

A. uniflòrum, Gray. Open woods or thickets; slightly clammy-pubescent, with 1–3 scapes (3′–5′ high) from a subterranean scaly base, and lance-awl-shaped calyx lobes half the length of the violet-purplish corolla.

A. fasciculàtum, Gray. Occurs only from N. Mich., W.; has scapes from a scaly base rising out of the ground, and short triangular calyx lobes. Parasitic on herbs, as Artemisia, etc.

LXXXIII. LENTIBULARIACEÆ, BLADDERWORT FAMILY.

Aquatic or marsh herbs, with the ovary and pod 1-celled and containing a free central placenta, with irregular bilabiate flowers (lower lip larger and 3-lobed), bearing a spur or sac underneath, and 2 stamens with confluently 1-celled anthers. Flowers on 1–few-flowered scapes.

1. UTRICULARIA. Calyx parted into 2 nearly entire lips. Corolla deeply 2-lipped, the lower lip bearing above a prominent palate closing the throat, and below a large spur. Anthers 2, converging in the throat of the corolla. Stigma 2-lipped. Leaves finely cut, mostly into threads or fibers, many bearing little air bladders; some are leafless.
2. PINGUICULA. Upper lip of calyx 3-cleft, lower 2-cleft. Lips of corolla distinctly lobed, the hairy or spotted palate smaller, so that the throat is open; otherwise as in Utricularia. Leaves all in a tuft at base of the 1-flowered scapes, broad and entire, soft and tender.

1. UTRICULÀRIA, BLADDERWORT. (*Utriculus,* a little bladder.) Flowers all summer. The following are the commonest species.

* *Plants floating by means of the hollow petioles of the upper whorled leaves.*

U. inflàta, Walt. Swimming free, the petioles of the whorl of leaves around the base of the 5–10-flowered scape inflated into oblong bladders, besides little bladders on the thread-like divisions of the leaves; corolla yellow, large. Still water, Me. and S., near the coast.

* * *Plants floating, the dissected leaves usually bearing little bladders on their lobes.*

+– *Flowers yellow.*

+– *Pedicels recurved in fruit.*

U. vulgàris, Linn. Common in still or slow water; the stems 1°–3° long and very bladder-bearing on the thread-like, many-parted, crowded leaves; flowers 5–10 in the raceme, large, with spur rather shorter than lower lip; the corolla closed.

U. mìnor, Linn. Leaves scattered, 2–4 times forked; scapes lower and weak, 2–8-flowered; corolla gaping, the spur very short and blunt or almost none. Shallow water, N. States.

+– +– *Pedicels erect in fruit.*

U. gíbba, Linn. Small, with short branches bearing sparse thread-like leaves and some bladders, 1–2-flowered scape only 1′–3′ high,

and with short slender branches at its base, and blunt conical spur shorter than lower lip. Shallow water, Mass., W. and S.

U. biflòra, Lam. Stems 4′–6′ long, bearing rootlet-like leaves and many bladders, 1–3-flowered peduncles 2′–4′ high, and awl-shaped spur as long as lower lip. Ill., W.; also near Cape Cod.

U. intermèdia, Hayne. In shallow water, with stems 3′–6′ long, bearing rather rigid leaves with linear-awl-shaped divisions, and no bladders, these being on separate leafless branches, the slender raceme few-flowered; spur nearly equaling the very broad lower lip. Pools, N. Eng., W.

\+ + *Flowers violet-purple.*

U. purpùrea, Walt. Flowers 2–4 on the peduncle, and a rather short spur appressed to the 3-lobed lower lip of corolla. Me., W. and S.

* * * *Simple and erect naked scape-like stem rooting in wet soil, with minute and fugacious grass-like leaves seldom seen; commonly no bladders; flowers yellow.*

U. subulàta, Linn. Mass., S. in wet sand; very slender, 3′–5′ high, with several very small slender-pediceled flowers.

U. cornùta, Michx. 6′–15′ high, bearing 2–4 large flowers crowded together on short pedicels, or S. with 4–12 more scattered and smaller flowers. Peat bogs and dryish lake borders throughout.

2. PINGUÍCULA, BUTTERWORT. (Name from Latin: *pinguis*, fat. Both names from the fatty or greasy-looking leaves, which in ours are more or less clammy pubescent.)

* *Corolla violet-purple, distinctly 2-lipped.*

P. vulgàris, Linn. Scarce on wet rocks along our northern borders; scape 2′ high; upper lip of corolla short; spur straightish and slender; flowers summer.

* * *Corolla light violet (rarely white), rather obscurely 2-lipped.*

P. pùmila, Michx. In moist sand from Car., S. and W., has rather large flower on scape 2′–6′ high, with blunt sac-like spur; flowers spring.

P. elàtior, Michx. Borders of ponds from N. Car., S., has scapes near 1° high, and large corolla (1′ wide) with blunt spur; flowers summer.

* * * *Corolla yellow, more bell-shaped, less distinctly 2-lipped, the 5 lobes often cleft.*

P. lùtea, Walt. Wet pine barrens, N. Car., S.; whole plant yellowish, with nodding flower (1′ or more wide) on scape 6′–12′ high, in spring.

LXXXIV. GESNERACEÆ, GESNERIA FAMILY.

Tropical plants, with 2-lipped or somewhat irregular corollas, didynamous stamens, a 1-celled ovary with two parietal many-seeded placentæ, — therefore botanically like the Broom Rape Family; but with green herbage, and not parasitic, and the common cultivated species have the tube of the calyx coherent at least with the base of the ovary. Many, and some very showy, plants of this order are in choice conservatories; the commonest are the following.

Sinníngia (or GLOXÍNIA) ***speciòsa***, Nicholson. The GLOXINIA of greenhouses; an almost stemless herb from Brazil, with ovate and crenately toothed leaves and 1-flowered scape-like peduncles; the deflexed corolla 2′ long, ventricose, between bell-shaped and funnel-form, gibbous, with a short and spreading somewhat unequal 5-lobed border, violet with a deeper-colored throat, in one variety white. ♃

Nægèlia (or GESNÈRA) ***zebrìna***, Regel. Stem tall, leafy; leaves petioled, cordate, velvety, purple-mottled; a terminal raceme of showy flowers nodding on erect pedicels; corolla tubular-ventricose, with a small 5-lobed and somewhat 2-lipped border, glandular, scarlet, with the under side and inside yellow and dark-spotted. There are several other species. ♃ Brazil.

Achimènes longiflòra, DC. Stem leafy; flowers in the axils of oblong or ovate hairy leaves, which they exceed; tube of the obliquely salver-shaped corolla over an inch long, narrow, the very flat 5-lobed limb 2′ or more broad, violet-colored above, — also a white variety. Propagates by scaly bulblets from the root. ♃ Central America.

Streptocárpus Réxii, Lindl. A stemless greenhouse plant from South Africa, with ovate-oblong, crenate, and wrinkled, pubescent, prostrate leaves, and blue flowers on a 2-bracted 1–2-flowered scape; calyx 5-parted; corolla limb oblique and bilabiate, the upper lip 2-lobed and the lower 3-lobed; 2 perfect stamens; ovary imperfectly 4-celled and 2-lobed.

S. polyántha, Hook. Has many flowers, white with purplish streaks, in a sort of loose panicle. Other species and hybrids are in cultivation.

LXXXV. BIGNONIACEÆ, BIGNONIA FAMILY.

Woody plants, or a few herbs, with more or less bilabiate flowers, diandrous or didynamous stamens (often with rudiments of the wanting ones), 2-lipped stigma, free variously 1-4-celled ovary, and fruit, usually a pod, containing many large, mostly flat and winged seeds filled with the large embryo; no albumen. Almost all woody plants, with opposite leaves, and 1–2-celled pods. (Lessons, Figs. 415, 416.)

* *Climbers (except one Tecoma), with compound leaves and 4 fertile stamens in two pairs.*

+ *Barely woody or herbaceous; ovary and pod 1-celled with 2 parietal placentæ.*

1. ECCREMOCARPUS. Calyx 5-cleft, short. Corolla tubular, with 5 short and round recurved lobes. Pod short. Seeds winged all round.

+ + *Woody-stemmed; ovary and pod 2-celled, but the placentæ parietal; valves of pod falling away from the partition; seeds with a broad thin wing.*

2. BIGNONIA. Calyx nearly truncate. Corolla tubular bell-shaped, 5-lobed. Pod flattened parallel with the valves and partition. Climbing by leaf-tendrils.

3. TECOMA. Calyx 5-toothed. Corolla funnel-shaped, tubular, or bell-shaped, 5-lobed. Pod flattish or flattened contrary to the partition, the edges of which separate from the middle of the valves. Leaves in ours odd-pinnate. The hardy species climb by rootlets.

* * *Trees, with simple leaves and 2 or rarely 4 fertile stamens.*

4. CATALPA. Calyx deeply 2-lipped. Corolla inflated bell-shaped, the 5-lobed border more or less 2-lipped and wavy. Pod very long and slender, hanging, the partition contrary to the valves. Narrow wings of the seed lacerate-fringed. (For corolla and stamens, see Lessons, Fig. 265.)

1. ECCREMOCÁRPUS. (Name Greek, meaning *hanging fruit.*)

E. scàber, Ruiz & Pav. (or CALÁMPELIS SCÀBER). From Chile, cult. in gardens and conservatories; tender, climbs by branched tendrils at the end of the twice pinnate leaves; leaflets roughish or smoothish, thin, ovate or heart-shaped; flowers in loose drooping racemes; corolla inflated club-shaped and gibbous, orange-red, about 1′ long.

2. BIGNÒNIA. (Named for the French *Abbé Bignon.*)

B. capreolàta, Linn. Climbing trees from Va. to S. Ill., and S. smooth, the leaves evergreen at the south, with a short petiole, and often what seems like a pair of stipules in the axil, a single pair of lance-oblong leaflets heart-shaped at base, and a branched tendril between them; flowers several in the axils, the corolla 2′ long, orange-red outside, yellow within, in spring.

B. venùsta, Ker. A greenhouse species from Brazil, producing an abundance of crimson-orange, funnel-form flowers, with a spreading border and hairy inside; leaves ternate (at least the lower ones), the leaflets ovate-oblong and acuminate.

3. TÉCOMA, TRUMPET FLOWER. (Mexican name abridged.) Formerly included under BIGNONIA, which name the species still bear in cultivation.

* *Plant climbing.*

+– *Corolla tube long or prominent, the flower funnel-form or salver-form.*

T. radìcans, Juss. TRUMPET CREEPER or TRUMPET VINE. Wild from Penn. and Ill. S., and commonly planted; climbing freely by rootlets; leaves of 5–11 ovate or lance-ovate, taper-pointed, and toothed leaflets; flowers corymbed; orange-yellow and scarlet corolla funnel-shaped, large.

T. Capénsis, Lindl. Has smaller and rounder leaflets, naked-peduncled cluster of flowers, long-tubular and curving orange-colored corolla 2′ long, and stamens protruded; conservatories. From Cape of Good Hope.

T. jasminoìdes, A. Cunn. A fine greenhouse species, from Australia, twining, very smooth, with lance-ovate, entire, bright green leaflets, and white corolla, pink-purple in the throat.

+– +– *Corolla bell-shaped, with the tube little longer than the calyx.*

T. grandiflòra, Delaun. Cult. from Japan and China, not quite hardy N., climbing little, with narrow leaflets, and 5-cleft calyx nearly equaling the tube of the corolla, which is bell-shaped, 3′ long and broad, much wider than in the foregoing.

* * *Plant an erect shrub.*

T. stáns, Juss. Native to Texas and W., but cult. S.; leaflets 5–11, lanceolate, incisely serrate; flowers yellow and with a wide-open tube, racemose or paniculate.

4. CATÁLPA or INDIAN BEAN. (Aboriginal name; the popular name alludes to the shape of the pods.)

C. bignonioìdes, Walt. (C. SYRINGÆFÒLIA). COMMON CATALPA. Tree wild Ga., S., and widely planted, especially in Middle States and S.; with large, heart-shaped, pointed leaves, downy beneath, open panicles (in summer) of white, much spotted flowers (1½′ long), with oblique limb and lower lobe entire, and thin pods 1° long; bark thin.

C. speciòsa, Warder. Taller, more erect tree and hardier N., where it is much planted; corolla about 2′ long and nearly white (inconspicuously spotted), the lower lobe emarginate; capsule thicker; bark thick and

cough; blooms a week or more in advance of the other. S. Ind., S. This and the above are sometimes called CIGAR TREE, from the alleged use of the ripe pods as cigars.

C. Kæmpferi, Sieb. & Zucc. Has smooth leaves, many of them 3-lobed or angled, and flowers one half smaller; small tree with very slender pods. Japan.

LXXXVI. PEDALIACEÆ, SESAMUM FAMILY.

Herbs, with simple leaves, opposite or some of the upper ones alternate, and fruit 2–4-celled (but the stigma of only 2 lips or lobes), by intrusion of the placentæ (truly 2-celled in the ovary), and fruit containing flat but thick-coated wingless seeds.

1. SESAMUM. Calyx 5-parted, short. Corolla tubular bell-shaped, 5-lobed; the 2 lobes of the upper lip shorter than the others. Stamens 4. Fruit an oblong obtusely 4-sided pod, 2-valved. Flowers solitary in the axils of the leaves, almost sessile.
2. MARTYNIA. Calyx 5-toothed, often cleft down one side. Flowers large, in a terminal corymb or raceme.

1. SÉSAMUM, SESAME. (The Greek name, from the Arabic.) ①

S. Índicum, Linn. From India and Egypt, somewhat cult. or running wild in waste places far S.; rather pubescent, with oblong or lanceolate leaves, the lower often 3-lobed or parted, pale rose or white corolla, 1′ long, and sweet oily seeds, used in the East for food, oil, etc.

2. MARTÝNIA, UNICORN PLANT. (*Prof. John Martyn*, an English botanist.) Clammy-pubescent and heavy-scented rank herbs, with long-petioled, rounded and obliquely heart-shaped, wavy-margined leaves, and large flowers, in summer. ①

M. proboscídea, Glox. COMMON U. Wild S. W., and cult. in gardens for the curious fruits which are used for pickles; coarse, with nearly entire leaves, large corolla whitish with some purple and yellow spots, and long-beaked fruit.

M. frágrans, Lindl. Cult. from Mexico, but wild in Texas; less coarse and clammy, with somewhat 3-lobed or sinuate-toothed leaves, and showy violet-purple vanilla-scented flowers.

LXXXVII. ACANTHACEÆ, ACANTHUS FAMILY.

Plants with opposite simple leaves, 2-lipped or otherwise irregular or even regular monopetalous corolla, 4 didynamous or else only 2 stamens, inserted on the corolla tube, 2-celled ovary and pod, and few seeds, — distinguished from the related orders by the seeds without albumen and borne on hook-like projections of the placentæ or on a sort of cup. Chiefly a tropical family; many in choice conservatories, here omitted.

* *Twining tropical herbs (or cult. as herbs), with nearly regular 5-lobed corolla, and globular seeds supported by a cartilaginous ring or shallow cup.*

1. THUNBERGIA. Flowers inclosed when in bud by a pair of large leaf-like bractlets borne below the short cup-shaped calyx. Corolla with a mostly somewhat curved tube and an abruptly wide-spreading border of 5 rounded equal lobes, convolute in the bud. Stamens 4, included. Pod globular, tipped with a long and conspicuous flattened beak, 2–4-seeded. Peduncles axillary, 1-flowered.

* * *Erect or spreading; all the following are herbs, with flat seeds borne on hook-like processes (retinacula); calyx 4–5-parted, mostly 2-bracted.*

\+ *Stamens 4.*

2. ACANTHUS. Corolla of one 3-lobed lip, the upper lip wanting. Stamens with 1-celled ciliate anthers. Leaves pinnatifid. Flowers in a spike.
3. RUELLIA. Corolla funnel-form, with an almost equally 5-lobed spreading border, convolute in the bud. Stamens included; cells of the anthers parallel. Pod narrow, contracted into a stalk-like base, above 8–12-seeded.

\+ \+ *Stamens 2.*

4. DIANTHERA. Corolla 2-lipped, the upper lip erect and notched; the lower 3-lobed, wrinkled or veiny towards the base, spreading. Cells of the anther one below the other, mostly unequal. Pod flattened above, contracted into a stalk-like base, 4-seeded above the middle.
5. DICLIPTERA. Corolla 2-lipped, the lower lip 3-lobed, the upper 2-cleft or entire; but the flower as it were reversed so that the 3-lobed lip seems to be the upper one. Stamens protruded; cells of the anther equal, but one placed below the other. Pod 2–4-seeded below the middle.

1. THUNBÉRGIA. (Named for the Swedish botanical traveler, *C. P. Thunberg.*) Showy flowers produced all summer.

T. alàta, Bojer. So named from its winged petioles; from Africa; the one commonly cultivated (as an annual) in many varieties as to size and color of flower, buff, orange, white, etc., usually with blackish-purple eye; herbage soft-downy or hairy; leaves between heart-shaped and arrow-shaped. ♃

T. fràgrans, Roxb. Glabrous on mature parts; leaves ovate, cordate or hastate at the base, obscurely toothed, or notched towards the base; flowers fragrant and pure white, one or two in each axil. Greenhouses. India. ♃

2. ACÁNTHUS. (Old Greek and Latin name, from the word for *spine* or *prickle.*) ♃

A. móllis, Linn. One of the classical species, from S. Eu., is occasionally cult., not hardy N.; the broad, sinuately and deeply pinnatifid leaves mostly from the root, hardly at all prickly; flowers on a short scape, dull-colored.

3. RUÉLLIA. (Named for the herbalist *Ruelle.*) Ours are wild herbs, chiefly southern, with purple or blue showy flowers, mostly in clusters, produced all summer. ♃

R. ciliòsa, Pursh. Stems 1°–4° high; clothed with soft white hairs, the oval or oblong leaves nearly sessile, pale blue corolla (about 2′ long) with slender tube much longer than the inflated upper part and than the bristle-shaped sepals. Dry soil, Mich. and Minn., S.

R. strèpens, Linn. Richer soil, from Penn. W. and S.; smooth or slightly downy, with obovate or oblong leaves (1′–4′ long) narrowed into a petiole, and purple-blue corolla (1′-2′ long) with tube hardly longer than the expanded portion or than the linear-lanceolate sepals.

4. **DIANTHÈRA.** (Greek for *double anther*, alluding to the two separated cells on each filament.) Flowers all summer. ♃

D. hùmilis, Engelm. & Gray. Muddy banks of streams S. Car., S.; 4′–8′ high, smooth, with lance-ovate, short-petioled leaves longer than the 3–4-flowered peduncles in their axils, and small pale purple flowers.

D. Americàna, Linn. Wet borders of streams; 2° high, smooth, with long linear-lanceolate leaves, and long peduncles (4′–6′ long) bearing an oblong spike of pale purple flowers.

5. **DICLÍPTERA.** (Greek words for *double, wing*, from the 2-valved pod.)

D. brachiàta, Spreng. Low banks, N. Car., S.; is nearly smooth, with 6-angled stem bearing many branches, thin ovate-oblong pointed leaves on slender petiole and interrupted spike-like clusters of small purple flowers, each with a pair of conspicuous flat bracts. ♃

LXXXVIII. VERBENACEÆ, VERVAIN FAMILY.

Plants with opposite (or sometimes whorled) leaves, differing from the other orders with irregular monopetalous and didynamous or tetrandrous flowers by the ovary not 4-lobed and with a single ovule in each of its (1–4) cells, the fruit either fleshy or when dry at length splitting into as many 1-celled indehiscent nutlets. Plants seldom aromatic.

* *Ovary 1-celled and 1-ovuled.*

1. PHRYMA. Flowers in slender loose spikes. Calyx cylindrical, 2-lipped, the upper lip of 3 slender-pointed teeth, the lower short and 2-toothed. Corolla tubular, 2-lipped, the upper lip notched, lower larger and 3-lobed. Stamens included. Ovary forming a simple akene in the calyx. Herbs.

* * *Ovary 2- or more-celled, with few to several ovules.*

+ *Flowers in heads, spikes, or racemes, the flowers expanding from below upwards.*

2. LANTANA. Flowers in heads or short spikes. Calyx minute, obscurely 4-toothed. Corolla with an unequal 4-cleft spreading border, the upper lobe sometimes notched. Stamens included. Ovary 2-celled, becoming berry-like, and containing 2 little stones or nutlets. Shrubs or herbs.

3. LIPPIA. Flowers in heads, spikes, or racemes. Calyx tubular, 2–5-toothed. Corolla tubular, with 5-lobed 2-lipped border, the lower 3-lobed lip larger. Stamens included. Ovary and dry fruit 2-celled, 2-seeded.

4. VERBENA. Flowers in spikes or heads. Calyx tubular or prismatic, 5-ribbed and plaited. Corolla salver-form, the tube often curved, the border rather unequally 5-cleft. Stamens included; upper pair sometimes wanting the anthers. Ovary 4-celled, at maturity splitting into 4 dry akenes or nutlets. Herbs.

+ + *Flowers cymose, expanding from above (or center) downwards.*

++ *Flowers nearly regular, in cymes from the axils of the simple leaves; shrubs.*

5. CALLICARPA. Calyx 4–5-toothed, short. Corolla tubular-bell-shaped, short, 4–5-lobed. Stamens 4, protruded, nearly equal. Ovary 4-celled, in fruit berry-like, with 4 little stones.

++ ++ *Flowers irregular.*

6. VITEX. Calyx 5-toothed. Corolla tubular (tube short), with a spreading 2-lipped border, the lower lip 3-parted and rather larger than the 2-lobed upper lip. Stamens 4, protruded, as is the style. Ovary 4-celled, becoming berry-like in the fruit, which

contains a single 4-celled stone. Flowers in cymes or clusters in the axils of the compound digitate leaves, or of the upper leaves reduced to bracts; shrubs or trees.

7. CLERODENDRON. Calyx bell-form or tubular, 5-toothed. Corolla tube slender and cylindrical, straight or curved; limb spreading or somewhat reflexed, 5 lobes unequal in size or position. Stamens 4, and inserted on the throat of the corolla, long-exserted. Ovary imperfectly 4-celled, the cells 1-ovuled. Style elongated and 2-lobed. Shrubs, erect or climbing, the leaves entire or rarely dentate.

1. PHRŸMA, LOPSEED. (Name of unknown meaning.) One species.

P. Leptostàchya, Linn. Copses, etc.; 2°–3° high, with coarsely-toothed, ovate, thin leaves, and branches terminated by the slender spikes of very small purplish flowers, in summer, the pedicels reflexed in fruit. 2l

2. LANTÀNA. (Origin of name obscure.) Tropical or subtropical, mostly shrubby plants, planted out in summer, when they flower freely until frost comes; stems often rough-prickly; herbage and flowers odorous, in some pleasant, others not so. The species are much mixed.

L. Cámara, Linn. Flowers deep yellow, turning first to orange, then to red; plant scabrous or hirsute, usually prickly; leaves ovate or ovate-oblong; head flat-topped. Ga., S., and cult.

L. mixta, Linn. Brazil; has flowers opening white, soon changing to yellow, orange, and finally to red.

L. nivea, Vent. Brazil; has the pleasant-scented flowers white and unchanging; or, in var. MUTÁBILIS, changing to bluish.

L. involucràta, Linn. West Indies; has small obovate and prominently veiny leaves, more or less downy beneath, and heads of lilac-purple flowers, involucrate by the outer bracts.

L. Sellowiàna, Link & Otto. Low and spreading, with wedge-oblong or ovate, strongly veined leaves, long peduncles, and heads of reddish-purple flowers lengthening somewhat with age. Southern Brazil.

3. LÍPPIA. (Named for *A. Lippi*, an Italian botanist.) Flowers late summer.

L. lanceolàta, Michx. FOG FRUIT. A creeping weedy herb, along river banks from Penn., S. and W., with wedge-spatulate or oblanceolate leaves serrate above the middle, and slender peduncles from the axils bearing a head of bluish small flowers.

L. citriodòra, HBK. (or ALOŸSIA), the LEMON-SCENTED or SWEET VERBENA of the gardens; shrub from Chile, with whorls of linear-lanceolate fragrant leaves, roughish with glandular dots, and small whitish and bluish flowers in slender spikes.

4. VERBÈNA, VERVAIN. (Latin name of some sacred herbs.) Flowers all summer. Genus of difficult analysis on account of numerous hybrids, both wild and in cultivation.

* VERVAINS, *native to the country, or growing as wild weeds, mostly in waste or cultivated ground; the flowers insignificant, in slender spikes, no appendage at tip of the anthers.*

+– *Stems erect or strict, mostly tall.*

+– ① 2l *Spikes filiform and loosely flowered, naked.*

V. officinàlis, Linn. EUROPEAN V. Nat. by roadsides. Stems 1°–3° high, branched; leaves sessile, 3-cleft, and mostly pinnatifid into narrow

cut-toothed lobes; small purplish flowers in very slender panicled spikes. ①

V. urticæfòlia, Linn. White V. Stem 4°–6° high; leaves oval or oblong-ovate, coarsely serrate, petioled; spikes of small white flowers slender and loose. ♃ Throughout.

++ ++ ♃ *Spikes thick, or at least densely flowered, with the fruits overlapping.*

V. angustifòlia, Michx. Stems 6′–18′ high; leaves narrow-lanceolate, sessile, roughish, slightly toothed; spikes few, thickish, crowded with purple flowers. Mass. to Minn., and S.

V. stricta, Vent. Barrens, W. and S.; whitish-hairy, 1°–2° high; leaves obovate or oblong, serrate, sessile; spikes thick and dense; flowers blue, larger than in the others.

V. hastàta, Linn. Blue V. Stem 4°–6° high; leaves lance-oblong, some of the larger with short side lobes at base, cut-serrate, petioled; spikes densely flowered, corymbed or panicled; flowers blue. Common along roadsides.

+- +- *Stems spreading on the ground.*

V. bracteòsa, Michx. From Mich. and Minn., S.; hairy; leaves wedge-shaped or lance-oblong, cut-pinnatifid or 3-cleft, short-petioled; small purple flowers in solitary loose spikes, the lower ones leafy-bracted.

* * Verbenas *of the garden sort, with creeping or spreading stems, and dense spikes of larger or showy flowers; anthers of the longer stamens with a gland-like tip.* ♃ ①

+- *Leaves generally sessile.*

V. teucroìdes, Gill. & Hook. Erect or spreading, with ovate oblong and incised leaves, and a lengthened spike of white or pale rosy flowers, sweet-scented, especially at nightfall. Brazil and S.

V. chamædrifòlia, Juss. The original Scarlet V., with oblong-lanceolate, coarsely serrate leaves, nearly all sessile, and most intense red or scarlet flowers, in a flat cluster. Brazil.

+- +- *Leaves petiolate.*

++ *Leaf-divisions or lobes wedge-form or broad.*

V. Aublètia, Linn. Wild from Ind., W. and S.; has cut-pinnatifid leaves, and a long-peduncled spike of purple flowers, minutely bearded in the throat. This and the several other species variously mixed, make up the garden Verbenas.

V. phlogiflòra, Cham. (V. Tweediàna). More upright; the leaves decidedly petioled; the flowers inclined to form an oblong spike, and crimson, varying to rose, but not to scarlet. Brazil.

V. incìsa, Hook. Like V. phlogiflòra, save in the pinnatifid-incised leaves, the petioled ones with a heart-shaped base; flowers in a flat cluster, rose-color or purple. Brazil.

V. venòsa, Gill. & Hook. Stems simple and ascending; leaves oblong and sub-cuneate, more or less clasping, incised-serrate, wrinkled and rough above, revolute; flowers lilac, in terminal more or less peduncled spikes. Brazil.

++ ++ *Leaf-divisions linear.*

V. erinoìdes, Lam. (V. multífida). Dwarf and much creeping, rough-hairy, with leaves pinnatifid into linear divisions, and originally with violet-purple flowers; and

V. ténera, Spreng. (V. pulchélla), with equally finely cut leaves, and rather larger, originally rose-violet flowers, are part parents of the smaller races. Both of Brazil.

5. **CALLICÁRPA.** (From Greek for *beautiful fruit.*) Flowers early summer.

C. Americàna, Linn. French Mulberry. Rich soil from Va. and Mo., S.; shrub 3°–8° high, with some scurfy down, especially on the lower face of the ovate-oblong toothed leaves, and the clusters of bluish flowers; fruits violet-blue and showy.

6. **VÌTEX**, CHASTE TREE. (The ancient Latin name.)

V. Ágnus-cástus, Linn. Chaste Tree. Of Mediterranean region; has 5–7 lanceolate, entire leaflets, whitened underneath, and bluish flowers in sessile clusters, forming an interrupted spike at the end of the branches; hardy only S.

7. **CLERODÉNDRON** (VOLKAMÈRIA). (Greek: *chance, tree.*)

C. trichótomum, Thunb. (C. serótinum). Erect shrub of out-door cultivation, with nearly opposite, ovate-acuminate, pubescent, long-petioled leaves, and a terminal, spreading, compound cyme of white flowers, with red loose calyx. Japan.

C. Thomsònæ, Balf. Greenhouse climber from tropical Africa, with bright crimson, handsome corollas in pure white calices; leaves ovate and acuminate, smooth.

LXXXIX. LABIATÆ, MINT FAMILY.

Chiefly herbs, with aromatic herbage, square stems, opposite simple leaves, more or less 2-lipped corolla (whence the name of the order), either 4 didynamous or only 2 stamens inserted on the corolla tube, 2-lobed stigma, and at once distinguished from all the related families by the deeply 4-parted ovary (as if 4 ovaries around the base of a common style), ripening into as many seed-like nutlets (never prickly) or akenes, each containing a single seed. Embryo usually filling the seed. As in all these families containing bilabiate plants, there are 2 lobes belonging to the upper and 3 to the lower lip of the corolla. Flowers from the axils of the leaves or bracts, usually in cymose clusters, or running into terminal racemes or spikes. The peculiar stamens of this family are shown in Lessons, Figs. 300–305.

* *Stamens 4, parallel and ascending, and projecting from a notch on the upper side of the corolla. Nutlets reticulated and pitted, obliquely fixed by the inner side near the base.*

+ *Lobes of the corolla nearly equal and oblong, turned forward so that there seems to be no upper lip, the filaments conspicuously projecting from the upper side.*

1. TRICHOSTEMA. Calyx 5-cleft in 2 lips, oblique. Filaments very long and slender, curved, coiled up in the bud.
2. TEUCRIUM. Calyx 5-toothed. Corolla with a deep cleft between the two upper lobes. Cells of the anther confluent.

+ + *Lobes of the corolla equally spreading; filaments slightly projecting (or included) from the notch between the 2 upper lobes.*

3. ISANTHUS. Calyx bell-shaped, equally 5-lobed, enlarging after flowering. Corolla only a little longer than the calyx, bell-shaped, with 5 equal spreading lobes.

* * *Stamens 4, reclining on the lower lobe of the corolla, the outer or lower pair longer; anthers 2-celled. Corolla usually turned down or declining. Nutlets smooth or smoothish, fixed by their base, as in all the following divisions.*

+ *Calyx deflexed in fruit, 5-toothed, the upper tooth or lobe much broadest and sometimes wing-margined.*

4. OCIMUM. Corolla short, the upper lip as it were of 4 lobes, the lower of one entire flat or flattish declined lobe scarcely longer than the upper. Filaments separate.
5. COLEUS. Corolla similar to the last, but the lower lobe longer and concave or boat-shaped, inclosing the stamens and style; filaments monadelphous.

+ + *Calyx little or not at all deflexed, and nearly regular.*

6. HYPTIS. Calyx with 5 less unequal or equal teeth. Corolla of 4 short similar upper lobes, and a longer abruptly deflexed saccate lower one; filaments separate.
7. LAVANDULA. Calyx 13–15-nerved, 5-toothed, the upper tooth mostly larger. Corolla with tube longer than the calyx, regularly 2-lipped, i.e. upper lip 2-lobed, lower 3-lobed, the lobes all equally spreading. Stamens included, but declined towards the lower lobe of the corolla.

* * * *Stamens 4 (and the lower or outer pair longest) or 2, straight and distant or diverging; anthers plainly 2 celled, not conniving in pairs. Lobes of the corolla flat and spreading, or the upper erect but not arched.*

+ *Flowers in large, loose terminal racemes or panicles.*

8. COLLINSONIA. Calyx ovate, enlarging and turned down after flowering, 2-lipped, the upper lip flat and 3-toothed, the lower 2-cleft. Corolla elongated and irregular; the lower lobe or lip much the larger, pendent, cut-toothed or fringed, the 4 others nearly equal and alike; tube with a bearded ring inside at the bottom of the enlarged throat; stamens 2 with anthers, or rarely 4. Cells of the anther diverging.
9. PERILLA. Calyx in flower 5-cleft, in fruit nodding and enlarging, becoming 2-lipped. Corolla short and rather bell-shaped, 5-cleft, the lower lobe a little longer. Stamens 4, nearly equal. Style deeply 2-cleft.

+ + *Flowers in clusters or whorls, or sometimes spicate.*

++ *Corolla short and rather bell-shaped, hardly if at all 2-lipped, the 4 or rarely 5 lobes nearly equal and all spreading.*

10. MENTHA. Calyx equally 5-toothed. Corolla with a 4-cleft border, the upper lobe a little broader and sometimes notched at the end. Stamens 4, nearly equal, similar.
11. LYCOPUS. Calyx 4–5-toothed. Corolla with 4 about equal lobes. Stamens 2; the upper pair, if any, without anthers.

++ ++ *Corolla evidently 2-lipped, but all the lobes of nearly equal length, the upper lip erect and mostly notched, the lower spreading and 3-cleft, the tube not bearded within; stamens with anthers only 2.*

12. CUNILA. Calyx equally 5-toothed, striate, very hairy in the throat, one half shorter than the corolla. Stamens 2, long and protruding; no rudiments of the upper pair.
13. HEDEOMA. Calyx 2-lipped, gibbous on the lower side near the base, hairy in the throat. Corolla short. Stamens 2, with anthers scarcely protruded, and 2 sterile short filaments tipped with a little head in place of anther.

++ ++ ++ *Corolla evidently 2-lipped, short, the upper lip erect or somewhat spreading and nearly entire or notched, the lower spreading or 3-cleft; stamens with anthers 4.*

= *Calyx naked in the throat.*

14. HYSSOPUS. Calyx tubular, 15-nerved, equally 5-toothed. Corolla with the middle lobe of the lower lip larger and 2-cleft. Stamens very long and protruding.

15. SATUREIA. Calyx bell-shaped, 10-nerved, equally 5-toothed. Corolla with lower lip of 3 nearly equal entire lobes. Stamens somewhat ascending. Leaves narrow.
16. PYCNANTHEMUM. Calyx oblong or short-tubular, about 13-nerved, equally 5-toothed or somewhat 2-lipped. Corolla with the lobes of the lower lip ovate and entire. Flowers crowded in heads or close cymes.

= = *Calyx hairy in the throat.*

17. ORIGANUM. Calyx about 13-nerved. Lower lip of the corolla of 3 similar lobes. Flowers crowded into spike-like clusters and furnished with imbricated, often colored bracts.
18. THYMUS. Calyx ovate, 13-nerved, 2-lipped; the upper lip 3-toothed and spreading, the lower cleft into 2 awl-shaped ciliate lobes. Corolla not strongly 2-lipped, the upper lip resembling the 3 lobes of the lower lip but notched at the apex. Stamens mostly protruding.

* * * * *Stamens* 4 *(the lower or outer pair longer), ascending or curved and with the plainly* 2*-celled anthers approximate or conniving in pairs under the erect and flattish but not arched upper lip. Calyx more or less* 2*-lipped.*

19. CALAMINTHA. Calyx not flattened. Corolla straight, with inflated throat, and 2-lipped border, the spreading lower lip 3-parted, its middle lobe entire or slightly notched.
20. MELISSA. Calyx with 3-toothed upper lip flat. Corolla more or less curved and ascending. Filaments arching and bringing the anthers together in pairs. Otherwise as in 19.

* * * * * *Stamens only* 2*, parallel and ascending under the erect or somewhat scythe-shaped entire or barely notched upper lip of the corolla; anthers* 1*-celled, either strictly so or by confluence of the* 2 *cells end to end.*

+ *Calyx naked in the throat and* 2*-lipped.*

21. SALVIA. Calyx with the upper lip 3-toothed or entire, the lower 2-cleft. Corolla deeply 2-lipped; the lower lip spreading or hanging, 3-lobed, the middle lobe larger and sometimes notched at the end. Filament as it were compound, the proper filament short and bearing on its apex an elongated thread-like or linear body (the connective, in fact) attached by its middle, one end of which ascending under the upper lip bears a linear 1-celled anther, the other descending bears the other smaller and imperfect cell, or a mere vestige of it, or is naked. Flowers usually large or showy.
22. ROSMARINUS. Calyx and corolla nearly as in Salvia, but the lateral lobes of the lower lip of the corolla erect and somewhat contorted (as in some Salvias also). Stamens resembling those of Monarda and protruded, but with a short tooth on the filament below the middle. Shrub.
23. BLEPHILIA. Calyx short-tubular, the upper lip with 3 awned, the lower with 2 nearly blunt teeth. Corolla with an expanded throat, bluish. Otherwise like Monarda, but flowers smaller.

+ + *Calyx mostly hairy in the throat and nearly equally* 5*-toothed.*

24. MONARDA. Calyx tubular, elongated, many-nerved. Corolla deeply 2-lipped, narrow in the throat, the oblong or linear lips about equal in length, the lower 3-lobed at the apex, its narrower middle lobe slightly notched. Stamens with long and simple filament bearing directly on its apex a linear anther. Flowers rather large, numerous in the whorled or terminal heads.

* * * * * * *Stamens* 4*, diverging or ascending; the upper or inner pair longer. Upper lip of the corolla erect or a little arching, the lower spreading.*

+ *Stamens exserted.*

25. LOPHANTHUS. Calyx rather unequally 5-toothed. Upper lip of corolla slightly 2-lobed, the lower moderately spreading, its middle lobe somewhat crenate. Stamens not parallel, the lower and shorter ones more or less ascending, the upper and longer ones diverging and declining, so as to seem the lower. Tall erect herbs, with small flowers clustered in panicled spikes.

+ + Stamens not exserted.

26. NEPETA. Calyx obliquely 5-toothed. Stamens parallel and ascending, and their anthers approaching in pairs under the upper lip of the corolla, their cells diverging from each other. Middle lobe of lower lip of corolla considerably largest.

27. CEDRONELLA. Flowers nearly like those of Nepeta; but the cells of the anthers parallel.

(35. PHLOMIS, of the next section, might, from the stamens, be sought for here.)

* * * * * * * *Stamens 4, the lower or outer pair longer, ascending and parallel, their anthers in pairs mostly under the concave or arched upper lip of the corolla. Plants not sweet scented, some of them bitter aromatic.*

+ Corolla decidedly 2-lipped; calyx also 2-lipped, irregular, closed in fruit.

28. BRUNELLA. Calyx tubular bell-shaped, reticulated, flattened on the upper side; the upper lip broad, flat, 3-toothed; the lower 2-cleft. Tube of the corolla dilated on the lower side just below the rather narrowed throat; upper lip arched and entire; lower widely spreading, with lateral lobes oblong, the concave middle one rounded and crenulate. Filaments 2-toothed at the apex, the lower tooth bearing the anther. Flowers in a terminal close head or short spike.

29. SCUTELLARIA. Calyx short, with the very short lips truncate and entire, and a large hump on the upper side, the whole helmet-shaped; the upper lip usually falling away when the fruit is ripe. Corolla with rather long ascending tube, the lateral lobes of the lower lip small and somewhat connected with the arched upper lip, the middle lobe larger and spreading, or the sides reflexed; anthers of the lower stamens 1-celled. Bitterish herbs, not aromatic, with flowers single in the axil of each bract or leaf.

+ + Corolla inflated funnel-form and rather slightly 2-lipped; calyx thinnish, open bell-shaped in fruit, the 5 teeth equal and pointless; flowers simply spiked, only one to each bract or floral leaf.

30. PHYSOSTEGIA. Upper lip of the corolla broad and a little arched, entire; lower of 3 broad and somewhat spreading short lobes. Smooth and scentless herbs, with thickish and sessile lanceolate or oblong leaves.

+ + + Corolla decidedly 2-lipped; calyx 5-toothed, regular, or sometimes obscurely 2-lipped, not closing in fruit; the teeth commonly awl-shaped or triangular, often rigid or spiny-tipped.

++ Stamens included in the tube of the corolla; calyx 10-toothed.

31. MARRUBIUM. Teeth of the calyx awl-shaped or spiny-tipped, recurved after flowering. Corolla small; upper lip erect. Bitter-aromatic plants; flowers in axillary capitate whorls.

++ ++ Stamens raised out of the tube of the corolla; calyx 5-toothed.

= Stamens not deflexed after flowering.

‖ Anthers opening crosswise by 2 unequal valves, the smaller one ciliate.

32. GALEOPSIS. Calyx tubular bell-shaped, 5-nerved, with spiny-tipped teeth. Corolla enlarged in the throat, the ovate and entire upper lip arched, the middle lobe of spreading lower lip obcordate. Flowers in axillary whorl-like clusters.

‖ ‖ Anthers opening lengthwise in the ordinary way.

o Calyx membranaceous and greatly enlarged, and almost shield-like.

33. MOLUCCELLA. Calyx with the border reticulated, veiny, entire, except 5 mucronate points. Corolla much shorter than the calyx; the middle lobe of its lower lip obcordate. Nutlets 3-sided.

o o Calyx ordinary, with sharp or awl-like teeth.

× Upper lip of corolla erect.

34. BALLOTA. Calyx somewhat funnel-form, with an expanding 5-toothed border, the tube 10-ribbed. Anthers approximate in pairs under the upper lip. Nutlets roundish on top.

× × *Upper lip of corolla more or less arched.*

35. PHLOMIS. Calyx tubular, with rigid narrow awl-shaped teeth from the notch of as many very short and broad lobes. Corolla as in Stachys. Upper pair of stamens (rather the longer) with an awl-shaped appendage at the base of the filaments.

36. LEONURUS. Calyx top-shaped, the awl-shaped teeth when old spreading and spiny-pointed. Corolla like Stachys, but middle lobe of lower lip obcordate. Stamens parallel. Nutlets truncate and sharply 3-angled. Stems erect. Flowers in close whorls in the axils of cut-lobed leaves.

37. LAMIUM. Calyx tubular bell-shaped, with 5 awl-shaped spreading teeth. Corolla much enlarged in the throat, the upper lip arching and with a narrow base, lateral lobes of lower lip very short, the middle one rounded and spreading or turned down, its base much narrowed. (Lessons, Fig. 256.) Stamens ascending under the upper lip. Nutlets truncate at the top.

= = *Stamens deflexed or contorted after flowering.*

38. STACHYS. Calyx mostly tubular bell-shaped, the teeth triangular or awl-shaped, sometimes rigid or even pungent. Corolla not enlarged in the throat, the upper lip entire or nearly so, the lower 3-lobed with the middle lobe nearly entire. Stamens ascending under the upper lip, but the outer pair turned down after discharging their pollen. Nutlets obtuse, but not truncate. Flowers crowded in whorls, most of these commonly approximate in a terminal raceme or spike.

1. TRICHOSTÈMA, BLUE CURLS. (Greek: *hair-like stamens.*) Ours are branching, loosely-flowered, rather clammy, low herbs, with entire leaves, and small flowers as it were panicled, blue, or changing to purple, in summer and autumn. ①

T. dichótomum, Linn. Common B. or Bastard Pennyroyal. Sandy fields, Mass., S.; 6′–12′ high, with mostly lance-oblong, short-petioled leaves.
T. lineàre, Nutt. Leaves linear or lance-linear, smoother. Conn., S.

2. TEÙCRIUM, GERMANDER. (Named for *Teucer*, King of Troy.) 2

T. Canadénse, Linn. In low grounds; 1°–3° high, downy, with ovate-lanceolate serrate leaves, downy beneath, and pale purple or rarely white flowers collected in a long spike, in late summer.

3. ISÁNTHUS, FALSE PENNYROYAL. (Greek: *equal flower*, i.e. parts of corolla regular.) ①

I. cærùleus, Michx. Common in sandy or sterile soil from Me., S. and W.; bushy-branched, clammy-pubescent, 6′–12′ high, with oblong 3-nerved entire leaves, and scattered, small blue flowers on axillary peduncles.

4. ÒCIMUM, SWEET BASIL. (Greek name, referring to the odor, the herbage sweet-scented.)

O. Basílicum, Linn. Sweet Basil. Low sweet herb, of kitchen gardens, from Asia, with ovate, somewhat toothed leaves, ciliate petioles and calyx, and bluish-white racemed flowers, in summer. ①

5. CÒLEUS. (Greek for *sheath*, alluding to the monadelphous stamens.) Cult. for the handsome colored foliage, from Java.

C. Blùmei, Benth. Leaves either blotched with crimson or bronze-red, or almost wholly colored, rhomb-ovate and acuminate-pointed and atenuated into a petiole below, with deltoid and sharp teeth; the inconspicuous flowers blue or bluish and racemed.

C. Verschaffèltii, Lem. Leaves ovate and scarcely narrowed below, acute but not acuminate, the teeth large and rounded and obtuse.

6. **HÝPTIS**. (Greek: *reversed*, from the lower lobe of the corolla.) Flowers late summer.

H. radiàta, Willd. Stems 2°–4° high; leaves lance-ovate, toothed; flowers white or purple-dotted, small, crowded in peduncled whitish-involucrate heads. ♃ Low ground, N. Car., S.

7. **LAVÁNDULA**, LAVENDER. (Latin *lavo*, lave, for which Lavender-water is used.)

L. vèra, DC. Cult. from S. Eu.; a low undershrub, barely hardy N., hoary, with lance-linear leaves, and slender spikes of bluish small flowers on long terminal peduncles, in summer.

8. **COLLINSÒNIA**, HORSE BALM. (*Peter Collinson* of London, who corresponded with Bartram and Linnæus.) Rather tall and large-leaved, strong-scented plants; flowers summer. ♃

C. Canadénsis, Linn. Rich Weed, Stone Root. Smooth, 2°–3° high, with ovate serrate leaves 3′–6′ long and on long petioles, and pale yellow, lemon-scented flowers on slender pedicels in panicled racemes. Rich woods, N. and S.

9. **PERÍLLA**. (Aboriginal name.) Native of China and Japan. ①

P. Nankinénsis, Decne. (P. ocymoìdes, var. crìspa.) Balsamic-scented, much-branched herb, cult. for its foliage, the ovate-petioled leaves generally dark purple or violet-tinged beneath, bronze-purple above, the margins wavy and deeply cut-toothed, the insignificant rose-colored or whitish flowers in panicled spike-like racemes, in late summer.

10. **MÉNTHA**, MINT. (Ancient Greek and Latin name.) Mostly spreading rapidly by running rootstocks; leaves toothed; the small flowers purplish-bluish, or almost white, in summer. Beside the following, other introduced species are occasionally found. ♃

* *Flowers in terminal spikes.*

M. vìridis, Linn. Spearmint. Green, nearly smooth, with oblong or lance-ovate, wrinkled-veiny, sessile leaves, and spikes narrow, dense, and leafless. Roadsides. Eu.

M. piperìta, Linn. Peppermint. Purplish, smooth, with ovate acute petioled leaves, and whorled clusters of flowers forming loose interrupted spikes. Wet places, and cult. for the oil. Eu. (Lessons, Figs. 97, 98.)

* * *Flowers in distinct axillary globular clusters.*

M. Canadénsis, Linn. Wild Mint. Pleasant-scented, hairy or a smooth variety, with ovate or lance-oblong, acute or pointed leaves on short petioles, and the whorls in the axils of some of the middle pairs. Low grounds.

11. **LÝCOPUS**, WATER HOREHOUND. (Greek: *wolf's foot*, of no application.) Resembling the Wild Mint, but bitter, and not aromatic, often producing slender, sometimes tuber-bearing runners from the base, smooth, the very small white flowers close-clustered in the axils of the leaves. in summer. Wild in shady moist soil. ♃

* *Leaves serrate only; producing filiform runners from the base.*

L. Virgínicus, Linn. BUGLE WEED. Stem obtusely 4-angled, a foot or two high; leaves oblong or ovate-lanceolate, entire towards the base, short-stalked and acute at both ends; calyx-teeth 4, shorter than the nutlets. Common.

L. rubéllus, Moench. Stem obtusely 4-angled; leaves ovate or lance-oblong, attenuate at both ends, sharply serrate in the middle; calyx-teeth 5, sharp, longer than the nutlets. Penn., W. and S.

* * *Leaves incised or pinnatifid; not stoloniferous.*

L. sinuàtus, Ell. Stem (1°–3°) acutely 4-angled; leaves oblong or lanceolate and acuminate, some of the uppermost only sinuate. Common.

12. CUNÌLA, DITTANY. (An old Latin name of unknown meaning.)

C. Mariàna, Linn. MARYLAND D. Dry hills through the Middle States; nearly smooth, 1° high, corymbosely much branched, with ovate or heart-shaped almost sessile serrate leaves (1′ long), and peduncled, loose cymes of purplish flowers, in summer. 2

13. HEDEÒMA. (Formed from a Greek name of a sort of Mint; refers to the sweet scent.) Low and fragrant-scented, growing in dry and open or sterile grounds, with small flowers in loose axillary clusters, all summer.

H. pulegioìdes, Pers. AMERICAN PENNYROYAL. The pungent aromatic scent and taste is like that of the English Pennyroyal or Mentha Pulegium of Eu.; 5′ 8′ high, erect and branching, hairy, with oblong-ovate, petioled leaves, few-flowered clusters, and bluish corolla scarcely exceeding the calyx. ①

H. hìspida, Pursh. On the plains from Minn. and Dak., S.; 2′–5′ high, hairy, with sessile, linear, entire, crowded leaves, and bristly-ciliate calyx, with subulate teeth. ①

14. HYSSÒPUS, HYSSOP. (The ancient Greek name of the plant, from the Hebrew.) 2

H. officinàlis, Linn. Cult. in gardens from the Old World, rarely running wild; smooth, tufted, simple stems or branches, 2° high; leaves lance linear and entire; small clusters of blue flowers crowded in a terminal spike, in summer.

15. SATURÈIA, SAVORY. (The ancient Latin name.) Aromatic; flowers summer.

S. horténsis, Linn. SUMMER SAVORY. Low and homely sweet herb of the gardens, sparingly run wild W., with oblong-linear leaves tapering at base, and pale or purplish small flowers clustered in their axils, or running into panicled spikes at the end of the branches. Eu. ①

16. PYCNÁNTHEMUM, MOUNTAIN MINT or BASIL. (Greek: *dense flower clusters.*) Several species, all aromatic-scented, 1°–3° high, in open, usually gravelly or sandy soil; flowers with pale corolla often purple-dotted, in late summer and autumn. 2 The following are most common.

* *Calyx not 2-lipped, the teeth all equal or nearly so.*

+ *Bracts and calyx teeth awn-tipped and rigid.*

P. arístàtum, Michx. Only from N. J., S., in pine barrens; minutely soft-pubescent; leaves lance-oblong or broadly linear, rigid, almost entire; flowers in heads, with bracts and calyx teeth as long as the corolla.

+- +- Bracts and calyx teeth not awned.

P. lanceolàtum, Pursh. Smoothish, not hoary, very leafy, bushy branched; leaves small and clustered, narrow-lanceolate or lance-linear, rigid, sessile, obtuse at base; flowers small, in numerous globular close heads which are crowded in terminal corymbs. Calyx teeth and bracts short, triangular; lips of the corolla very short. Mass., W. and S.

P. linifòlium, Pursh. Like the last, less common N.; smoother, with lance-linear leaves, and narrower sharp-pointed bracts and calyx teeth.

P. mùticum, Pers. Minutely soft-downy but hardly whitened, rather low, bushy-branched; leaves mostly lance-ovate and sessile, with rounded or slightly heart-shaped base, minutely sharp-toothed, rather rigid; flowers in heads or dense clusters; calyx teeth and inner bracts rather blunt. Me., W. and S.

Var. **pilòsum**, Gray. Downy, with rather long, soft hairs; the broadish lanceolate leaves acute at both ends and nearly entire; whorled heads at the end of the branches; the calyx teeth and bracts ovate-lanceolate and acute. Ohio, W.

* * *Calyx 2-lipped (3 upper teeth united).*

P. incànum, Michx. Leaves petioled, ovate or oblong, remotely toothed, finely soft-downy above and white-hoary beneath, those next the open flat cymes whitened both sides; bracts and calyx teeth somewhat awn-pointed. N. Eng., W. and S.

17. ORÍGANUM, MARJORAM. (Old Greek name, said to mean *delight of mountains.*) Natives of the Old World; sweet herbs; flowers summer. ♃

O. vulgàre, Linn. Wild Marjoram. Old gardens, and wild on some roadsides; 1°–2° high, with small ovate, nearly entire leaves, on short petioles, and purplish flowers in corymbed purple-bracted clusters or short spikes; calyx equally 5-toothed.

O. Majoràna, Linn. Sweet Marjoram. Cult. in kitchen gardens as an annual; leaves small and finely soft-downy; the bracts not colored; flowers whitish or purplish, with calyx hardly toothed but cleft nearly down on the lower side.

18. THÝMUS, THYME. (Ancient Greek and Latin name.) Low or creeping, slightly woody-stemmed, sweet-aromatic plants of the Old World; flowers small, in summer. Leaves in the common species entire, small, from $\frac{1}{4}'$ to near $\frac{1}{2}'$ long, ovate, obovate or oblong, with tapering base. ♃

T. Serpýllum, Linn. Creeping Thyme. Cult. as a sweet herb, rarely a little spontaneous; creeping, forming broad flat perennial turfs; leaves green (a variegated form used for edgings); whorls of purplish or flesh-colored flowers crowded or somewhat spiked at the ends of the flowering branches.

T. vulgàris, Linn. Common Thyme. Sometimes cult.; more upright and bushy than the other, pale and rather hoary; flowers in shorter clusters.

19. CALAMÍNTHA, CALAMINT. (Greek for *beautiful Mint.*) Flowers summer. ♃ (Lessons, Fig. 301.)

* *Flowers loose in the axils, or above running into racemes or panicles.*

C. glabélla, Benth. A delicate native but uncommon species, from S. Ind., S.; smooth, with weak stems 5′–20′ long, also with creeping run-

ners, oblong or almost linear leaves, or ovate on the runners, the loose purplish flowers about $\frac{1}{3}'$ long.

C. Nepeta, Link. Basil Thyme. Nat. from Eu. from Md., W. and S.; soft-downy, branching, 1°–2° high, with round-ovate crenate leaves, small and loose purple flowers, and calyx hairy in the throat.

* * *Flowers in terminal heads or head-like whorls, crowded with awl-shaped bracts.*

C. Clinopòdium, Benth. Basil. Waste grounds and along thickets; hairy, with rather simple stems 1°–2° long, ovate, and nearly entire petioled leaves, and pale purple small corollas.

20. MELÍSSA, BALM, BEE BALM. (Old name from Greek for *bee*.) Old World sweet herbs. Flowers summer. ♃

M. officinàlis, Linn. Common B. Gardens, sparingly running wild; rather hairy, loosely-branched, lemon-scented, with ovate or scarcely heart-shaped crenate-toothed leaves, and yellowish or soon white flowers in small loose axillary clusters.

21. SÁLVIA, SAGE. (Latin *salvo*, save, from its reputed healing qualities.) (Lessons, Figs. 302, 303.)

* *Blue-flowered species (corolla sometimes partly white).* ♃

+– *Leaves halberd-shaped or triangular-ovate.*

S. pàtens, Cav. Mexico; 2°–3° high, rather hairy, with crenate-serrate pubescent leaves, the uppermost sessile ones sometimes oval, loose-pediceled flowers, showy deep blue corolla over 2′ long, the lips widely gaping. Cult. in borders.

+– +– *Leaves narrower, not halberd-like at base.*

++ *Flowers in distinct whorls near the top of the stem.*

S. lyràta, Linn. Sandy soil from N. J. to Ill. and S.; 1°–2° high, rather hairy, with leaves mostly at the root, and obovate or lyre-shaped, and a smaller pair on the stem; whorls of flowers forming an interrupted raceme; corolla hardly 1′ long; upper lip of calyx 3-toothed; lower cell of the anther present but deformed.

S. officinàlis, Linn. Common Sage. From S. Eu.; low but erect, minutely hoary-pubescent, with oblong-lanceolate leaves finely reticulated-rugose and the margins crenulate, spiked flower-whorls, and short corolla.

++ ++ *Flowers in racemose or spiciform inflorescence, the whorls, if any, small and loose.*

= *Corolla tube scarcely exserted beyond the calyx. Flowers small.*

S. urticifòlia, Linn. Woodlands from Md., W. and S.; 1°–2° high, leafy, somewhat clammy-downy; leaves rhombic-ovate; racemes slender, the blue and white corolla only $\frac{1}{3}'$ long; lower cell of the anther wanting.

= = *Corolla tube conspicuously exserted.*

S. azùrea, Lam. Sandy soil S. Car., S. and W.; nearly smooth and green, with rather simple stems, 2°–4° high; leaves lance-linear, with tapering base, obtuse, entire, or the lower serrate; the showy azure-blue flowers (less than 1′ long) numerous in a spike-like raceme.

Var. **grandiflòra**, Benth. (S. Pítcheri). Kansas to Texas; inflorescence denser; minutely soft-downy; occasionally cultivated.

S. praténsis, Linn. Radical leaves large and long-petioled, oblong or oblong-ovate and crenate-toothed, the stem leaves few and oblong, and shorter-stalked; corolla an inch long, glabrous inside, the mouth gaping and upper lip much arched, the calyx and small bracts colored; flowers about 4 in a whorl in long spikes. Eu. Borders. Varieties with reddish and white flowers.

S. farinàcea, Benth. Texas; leaves petioled, oblong-lanceolate, the spikes, calyxes, etc., white-hoary, contrasting with the light blue corolla. Sometimes cult.

* * *Red-flowered species, rarely running to white in garden forms.*

+ ① *Flowers small, not showy (but the bracts are).*

S. Sclàrea, Linn. Clary. Gray-hairy, 2°; leaves oblong and obtuse, petiolate, wavy; flowers in a long interrupted spike of whorls, the corolla tube not exceeding the calyx; upper bracts broad and concave, red and veiny, showy. S. Eu. Cult., the leaves used for seasoning.

+ + ♃ *Flowers large and showy.*

++ *Plant glabrous.*

S. splèndens, Sellow. Brazil; stems branching; leaves ovate, pointed, the floral ones and calyx as well as the corolla (2′ or more long and with short lower lip) bright scarlet. Much cult. There is a white variety.

++ ++ *Plant pubescent or hairy.*

S. fúlgens, Cav. Cardinal or Mexican Red S. From Mexico; tall, pubescent, with crenate ovate or oval leaves heart-shaped at base and somewhat rugose, green calyx, and long-tubed, downy, deep scarlet corolla over 2′ long, the style plumose.

S. coccínea, Linn. Somewhat downy or soft-hairy, with ovate and heart-shaped, acute, crenate leaves, deciduous bracts, green or purplish calyx, and smooth red corolla 1′ long, with lower lip much longer than the upper one. Var. **pseudo-coccínea** is taller, with bristly-hairy stems, and petioles. S. Car., S. (Lessons, Fig. 303.)

* * * *White-flowered species.*

S. argéntea, Linn. Mediterranean region; cult. for its silvery-white foliage, hardy; the very large round-ovate root-leaves clothed with long white wool; flowering stem and its sessile leaves, as well as calyx, etc., clammy-hairy; the white corolla with scythe-shaped upper lip 1′ long and a very short tube.

22. **ROSMARÌNUS**, ROSEMARY. (Latin: *dew of the sea*, referring to the habitat.) ♃

R. officinàlis, Linn. Leaves evergreen, linear, entire, with revolute margins, white-hoary beneath, the upper with pale blue flowers in their axils. S. Eu.; not hardy N.

23. **BLEPHÍLIA**. (Greek: *eyelash*, the bracts strongly ciliate, the outer ones ovate.) Flowers summer. ♃

B. ciliàta, Raf. Leaves almost sessile, ovate or oblong, whitish-downy beneath; outer bracts large, acute; corolla hairy. Dry soil, Mass. to Minn., and S.

B. hirsùta, Raf. Hairy all over; leaves lance-ovate, sometimes heart-shaped at base, on distinct petioles; bracts smaller and very slender-pointed; corolla smoothish, purple-spotted. Moister places, N. and S.

24. **MONÁRDA**, HORSEMINT or BALM. (An early Spanish writer on the medicinal plants of the New World, *Nicolas Monardez.*) Flowers summer. (Lessons, Fig. 300.)

* *Stamens and style protruding beyond the narrow acute upper lip of the corolla; leaves oblong-ovate or lance-ovate, with roundish or slightly heart-shaped base, veiny, pleasant-scented.* 2

M. dídyma, Linn. OSWEGO TEA, BEE BALM, FRAGRANT BALM. Leaves petioled, the floral ones tinged with red; calyx naked in the throat; corolla bright red, the large heads handsome. N. Eng., W. and S., and cult.

M. fistulòsa, Linn. WILD BERGAMOT. Soft-downy or smoothish; leaves petioled, the floral ones often whitish; calyx very hairy in the throat; corolla rose-color, purple, or white. Dry soil, Vt., W. and S. Variable.

M. Bradburiàna, Beck. Differs from the preceding in the sessile leaves soft-hairy beneath, calyx contracted above, and shorter corolla. Ind., S. and W.

* * *Stamens not longer than the purple-spotted notched upper lip of the short corolla, the tube of which is nearly inclosed in the calyx.*

M. punctàta, Linn. HORSEMINT. Sterile ground, from N. J. to Minn., and S.; strong-scented and pungent, slightly hoary; leaves lanceolate, the floral ones and bracts tinged yellow and purple; calyx teeth short and awnless; corolla yellowish. 2

M. citriodòra, Cerv. Calyx strongly bearded in the throat and with awn-like teeth, the floral leaves and bracts conspicuously awn-tipped. Neb., S. and W. ①

25. **LOPHÁNTHUS**, GIANT HYSSOP. (Greek: *crest* and *flower.*) Wild in rich soil, chiefly N. and W., with ovate and toothed leaves; flowers summer. 2

* *Leaves white beneath.*

L. anisàtus, Benth. Slender, with anise-scented leaves, glaucous white-downy beneath, and calyx much shorter than the lavender-blue corolla. Wis., W. and S.

* * *Leaves not white beneath.*

L. nepetoìdes, Benth. Smooth, coarse, not sweet-scented; stem 4°–6° high and sharply 4-angled; calyx teeth ovate, bluntish, almost equaling the dull yellowish corolla. Vt., W. and S.

L. scrophulariæfòlius, Benth. Resembles the preceding, but the obtusely angled stem and sharper-toothed leaves rather pubescent, the lanceolate acute calyx teeth shorter than the purplish corolla.

26. **NÉPETA**, CATMINT. (Latin, from the Etrurian city *Nepete.*) 2

N. Catària, Linn. CATNIP. Weed nat. from Eu., around dwellings and gardens, with strong fragrance; soft-downy; leaves oblong, heart-shaped, deeply crenate; whitish flowers crowded in terminal clusters or spikes, in late summer.

N. Glechòma, Benth. GROUND IVY, GILL. Weed nat. from Eu. in waste or cult. shaded grounds; creeping and spreading, with smoothish, rounded, kidney-shaped, crenate leaves on slender petioles, and light blue flowers in their axils, each pair of anther cells approaching and forming a little cross; flowers all spring and summer.

27. CEDRONÉLLA. (From *Cedrus*, the cedar tree, referring to the fragrance of one species.) 2l

C. cordàta, Benth. Shady grounds from W. Penn. S., but rare; low, hairy, with long leafy runners, heart-shaped leaves, and scattered flowers, the purplish corolla 1½′ long, its throat inflated.

C. càna, Hook. Mexico, and cult.; pale or ashy; leaves ovate-lanceolate, somewhat toothed; corolla an inch or less long, pink, the flowers in close clusters; 1°–3°.

28. BRUNÉLLA, SELF-HEAL or HEALALL. (Latinized from the old German name.) Flowers all summer. 2l

B. vulgàris, Linn. Low, spreading, with ovate or oblong petioled leaves, and 3 flowers under each of the broad and round purplish bracts of the head; corolla bluish-purple or rarely white. Woods and moist grounds; common in thin lawns.

29. SCUTELLÀRIA, SKULLCAP. (Latin *scutella*, a dish.) Flowers in summer, in our species blue or violet. 2l

* *Flowers small in axillary or some terminal one-sided racemes.*

S. lateriflòra, Linn. Mad-dog Skullcap from the shape of the fruiting calyx; smooth, branching, 1°–2° high, with lance-ovate or oblong acute coarsely serrate leaves on slender petioles; racemes rather leafy-bracted; flowers ¼′ long. Shady wet places; common.

* * *Flowers large, in racemes or spikes terminating the stem and branches.*

⊢ *Stem leaves all cordate; lateral lobes of the corolla about equaling the upper lip.*

S. versícolor, Nutt. Stem stout, 1°–3° high, soft-pubescent, as are the heart-shaped, very veiny and rugose, crenate and bluntish long-petioled leaves; spike-like racemes clammy-pubescent; corolla almost 1′ long, the lower lip purple-spotted. Banks, Penn. to Minn., and S.

S. saxátilis, Riddell. Glabrous or only slightly hairy; stem 6′–18′, weak, often producing runners; leaves ovate or oblong, obtuse, crenate. Moist banks, Del., W. and S.

⊢ ⊢ *Stem leaves not cordate (save occasionally the lowermost); lateral lobes of corolla shorter than upper lip.*

⊢⊢ *Green, nearly glabrous.*

S. serràta, Andr. 1°–3°, the raceme single and loosely flowered; leaves ovate to ovate-oblong, tapering at both ends, serrate; corolla 1′ long and narrow, its lips of equal length. Woods, Penn., W. and S.

⊢⊢ ⊢⊢ *Grayish, pubescent to tomentose.*

S. canéscens, Nutt. Ontario, S.; stems branching, 2°–4° high; leaves petioled, ovate or lance-ovate, or some of them heart-shaped at base, the lower surface, as also the racemes and flowers, whitish, with very fine soft down, otherwise smoothish; corolla 1′ long.

S. pilòsa, Michx. Pubescent with spreading hairs; stem nearly simple, 1°–3° high, bearing rather distant pairs of roundish or oblong-ovate veiny leaves, the lower sometimes heart-shaped, upper on short-margined petioles; racemes short, the bracts spatulate; corolla ¾′ long. N. Y., W. and S.; variable.

S. integrifòlia, Linn. Minutely hoary, 1°–2° high; leaves lance-oblong or linear, obtuse, nearly entire, very short-petioled; raceme short; corolla 1′ long, much enlarged upwards. Dry places, N. Eng., S.

* * * *Flowers short-peduncled in the axils of some of the sessile leaves.*

S. nervòsa, Pursh. Moist grounds from N. Y., S. and W.; smooth, 1°–2° high, slender; leaves roundish or ovate, sparingly toothed, 1′ long, those subtending the flowers ovate-lanceolate and entire, the nerve-like main veins prominent beneath; flowers ¼′ long.

S. párvula, Michx. Low and spreading, 3′–6′ high; with round-ovate or lance-ovate and slightly heart-shaped leaves ½′ or more long, and flowers ¼′ long. Sandy moist places, N. Eng., W. and S.

S. galericulàta, Linn. Smoothish; the slender simple stems 1°–2° high; leaves ovate-lanceolate, sometimes with a heart-shaped base, acute, serrate; flowers ¾′ long, with arched upper lip. Wet places, N.

30. **PHYSOSTÈGIA**, FALSE DRAGON'S HEAD. (Name from Greek words for *inflated* or *bladdery covering.*) Flowers all summer. 2

P. Virginiàna, Benth. Wet banks of streams, from Vt., W. and S., in several varieties; 1°–4° high; leaves mostly serrate; flowers either crowded or rather distant in the spikes; corolla pale rose-purple, 1′ or more long. Handsome.

31. **MARRÙBIUM**, HOREHOUND. (Late Latin name, from Hebrew word for *bitter.*) Flowers late summer. 2

M. vulgàre, Linn. Common H. In gardens and waste places, from Eu.; branching, spreading, hoary-downy, with round-ovate crenate-rugose leaves on petioles, and small white corolla.

32. **GALEÓPSIS**, HEMP NETTLE. (Greek: *like a weasel;* the likeness not obvious.) Flowers summer. ①

G. Tetràhit, Linn. Damp waste and cult. grounds, nat. from Eu.; a common weed, rather bristly-hairy, with stem swollen below each joint, leaves ovate and coarsely serrate, and corolla purplish or variegated.

33. **MOLUCCÉLLA**, MOLUCCA BALM, SHELL FLOWER. (Name from Molucca Islands.) Flowers summer. ①

M. lævis, Linn. Erect, much branched, smooth, with roundish petioled leaves, flowers sessile in their axils accompanied by spine-like bracts, the remarkable large cup-shaped calyx oblique and 1′ long, much exceeding the inconspicuous corolla. Cult. from Asia.

34. **BALLÒTA**, BLACK HOREHOUND. (Greek name, unexplained.)

B. nìgra, Linn. A green, erect, more or less hairy plant, naturalized E. from Eu.; leaves ovate and toothed; flowers purplish, in dense whorls; calyx teeth longer than corolla tube. 2

35. **PHLÒMIS**, JERUSALEM SAGE. (Old Greek name of some woolly plant.) Flowers summer. 2

P. tuberòsa, Linn. Cult. in old gardens, sparingly run wild; stems 3°–5° high; leaves ovate or ovate-oblong and heart-shaped, crenate, rugose, smoothish; flowers in remote and dense whorls; upper lip of the purple corolla white-hairy inside. Eu.

36. LEONÙRUS, MOTHERWORT. (Greek: *lion's tail*, but there is no obvious resemblance.) Flowers late summer.

L. Cardìaca, Linn. Common M. Nat. from Eu., in cult. and waste grounds; tall, with palmately cleft, long-petioled leaves, the lower rounded, the upper wedge-shaped at base; upper lip of pale purple corolla bearded. ♃

There are two other introduced species, less common.

37. LÀMIUM, DEAD NETTLE. (Greek: *throat*, alluding to the grinning corolla.) Low spreading herbs from Old World, in waste grounds; flowers spring and summer. (Lessons, Fig. 256.)

* *Insignificant weeds in waste or cultivated grounds, with few small and purple or slender flowers in some of the axils.* ① ②

L. amplexicáule, Linn. Leaves rounded, deeply crenate-toothed and cut, the upper ones clasping; corolla with a long tube, its upper lip bearded, the lower one spotted. Frequent.

L. purpùreum, Linn. Leaves more heart-shaped, and less cut, all of them petioled. Less common.

* * *Flowers larger, 1′ long, in several axillary whorls; corolla ascending, the lateral lobes bearing a slender awl-shaped appendage.* ♃

L. álbum, Linn. Gardens and waste grounds; hairy; leaves all petioled, ovate and heart-shaped, rugose-veiny; flowers white. N. Eng.

L. maculàtum, Linn. Cult. and sparingly escaped; hairy or nearly smooth; leaves as in the other, but with a white spot or blotch on the upper face; flowers purple.

38. STÀCHYS, HEDGE NETTLE. (Greek: *spike*, from the inflorescence.) Flowers in summer, in all ours ♃

* *None of the leaves truly cordate.*

+– *Leaves linear-oblong or narrower.*

S. hyssopifòlia, Michx. Wet sandy soil, Mass. to Mich., and S., not common; smooth, low (1° high); leaves almost entire, sessile; calyx teeth softer and less pointed than in the next.

+– +– *Leaves oblong-ovate or broader.*

S. palústris, Linn. Common in many varieties in wet grounds; rough-hairy; leaves oblong or lance-ovate, sessile and crenate-serrate, and somewhat obtuse, downy or hairy-pubescent; calyx teeth sharp-pointed or pungent, half the length of the corolla; upper lip of the purplish corolla pubescent, and the calyx hispid.

S. áspera, Michx. Stem usually glabrous, but with stiff reflexed bristles at the joints; leaves like the last (often nearly glabrous) but petioled; calyx commonly glabrous, as well as the corolla. Common in wet grounds.

Var. **glàbra**, Gray, is generally glabrous throughout, with long-petioled leaves. Western N. Y., W. and S.

S. lanàta, Jacq. Stems erect, tufted, which, like the Mullein-like leaves, and dense interrupted spike, are wholly covered with thick and silvery white wool; corollas very short dull purple. Cult. from Old World.

* * *Many or all the leaves distinctly cordate.*

S. coccínea, Jacq. Scarlet S. Leaves ovate-oblong and heart-shaped, pubescent; flowers whorled with bright red corolla, its tube often 1′ long; 1°–2°. Mexico and Texas. **Cult.**

S. Siebòldi, Miq. (S. TUBERÍFERA and S. AFFÌNIS of gardens). CHOROGI. CROSNES. Low hairy plant (12′–18′), with rather thick, more or less hairy, notched leaves on short strong petioles; producing many white and crisp, jointed tubers 2′–3′ long, under ground, and for which the plant is cultivated. China.

S. Betónica, Benth. (BETÓNICA OFFICINÀLIS). BETONY, BISHOP'S-WORT. A European plant occasionally seen in old gardens and once esteemed for medicinal purposes; 6′–2°, with petiolate and oblong-cordate, obtuse, crenate leaves, and red-purple hairy corolla $\frac{3}{4}'$ long; flowers in spicate whorls.

XC. PLANTAGINACEÆ, PLANTAIN FAMILY.

Consists almost entirely of the very familiar weedy genus

1. PLANTÀGO, PLANTAIN, RIB GRASS. (The old Latin name.) Flowers in a spike, on a naked scape, small and inconspicuous. Sepals 4 (or rarely 3 from 2 of them growing together), imbricated, persistent. Corolla short salver-form, thin and membranaceous, usually becoming scarious and dry, or withering on the pod; lobes 4. Stamens 4 (or rarely 2) borne on the tube of the corolla; filaments usually lengthening suddenly at flowering time and hanging (as in Grasses), bearing the 2-celled anthers. Style and long hairy stigma single and thread-like. Ovary 2-celled or falsely 3–4-celled in P. decipiens. Pod 2-celled, a *pyxis*, the top falling off as a lid, and the partition then falling out along with the 1 or more seeds. Leaves parallel-ribbed, all from the ground. The following are the common species; flowers summer.

* *Flowers all perfect, in each the style generally protruded a day or two before the anthers open or are hung out; lobes of corolla remaining wide open; stamens* 4.

+– *Flowers all alike, style protruded first.*

++ *Corolla glabrous on the outside; leaves strongly ribbed and not fleshy.* 2*l*

= *Ribs of the leaves springing from the midrib.*

P. cordàta, Lam. Leaves broad, cordate, or round-ovate, 3′–8′ long, long-stalked; spike becoming loosely flowered. By streams, N. Y., W. and S.

= = *Ribs running to the contracted base of the leaves.*

‖ *Leaves ovate or oval in outline.*

P. màjor, Linn. COMMON P. Smooth or sparsely hairy, with ovate or oblong or slightly cordate leaves, which are sometimes toothed; spike dense and blunt at the top; pod ovoid, dividing near the middle, 8–18-seeded, the seeds angled and reticulated. Very common in dooryards and waste places, the scapes rising from 6′–12′.

P. Rugélii, Decne. Leaves thinner and paler; spikes long and attenuate; pod cylindrical-oblong, dividing much below the middle, and only 4–9-seeded; seeds not reticulated. Vt., W. and S.

‖ ‖ *Leaves long and narrow.*

P. lanceolàta, Linn. RIB GRASS, RIPPLE GRASS, or ENGLISH PLANTAIN. Nat. from Eu. in fields, and a bad weed in poor lawns; rather hairy, with

lanceolate or lance-oblong 3–5-ribbed leaves, a grooved-angled scape, thick and close spike, two of the sepals mostly united into one, and 2-seeded pod.

++ ++ *Corolla pubescent outside; leaves indistinctly ribbed and fleshy.*

P. decípiens, Barn. Leaves 5′–12′ long, about equaling the slender and rather loose spike. Generally ①, sometimes ②, in salt marshes from N. J., N.

P. marítima, Linn., occurring on the coast, from Mass., N., is ♃ and has a denser spike.

+- +- *Flowers of two sorts as respects lengths of filaments and anthers; some plants with cleistogamous flowers with stamens and style barely or not at all protruded; other and less fertile plants have long-exserted stamens.*

P. Patagónica, Jacq. Leaves narrow-linear to oblanceolate, silky, sparingly-toothed or entire, 1–3-nerved; scape 3′–12′ long, with a dense cylindrical spike; seeds 2, oblong, oval or boat-shaped. Dry places, mostly W., very variable. ①

* * *Flowers nearly diœcious, the corolla in the most fertile plant closing over the pod and forming a kind of beak, the anthers not protruding; in the sterile plant the corolla is spreading and the anthers exserted; stamens* 4 *or* 2. ① ②

+- *Stamens* 4; *leaves oblong or broader.*

P. Virgínica, Linn. In sandy grounds, S., N. Eng., S. and W.; hairy or hoary, 2′–9′ high; leaves varying from oblong to obovate, nearly sessile, 3–5-nerved, generally sparingly toothed; spike rather dense; seeds mostly 2.

+- +- *Stamens* 2; *leaves linear or filiform.*

P. pusílla, Nutt. Sandy soil, N. Y., S. and W.; minutely pubescent, the leaves entire and not fleshy; spike slender; pod short-ovoid and 4-seeded, little exceeding the calyx and bract.

P. heterophýlla, Nutt. Leaves rather fleshy, sometimes toothed or lobed below; pod oblong-conical and 10–∞-seeded, about twice the length of the calyx and bract. Low lands, Penn., S.

III. Apetalous Division.

Includes the families with flowers destitute of corolla, or of both corolla and calyx. Various apetalous genera and species are, however, distributed through the polypetalous and monopetalous families, where they evidently belong. These three divisions are entirely artificial.

XCI. NYCTAGINACEÆ, FOUR-O'CLOCK FAMILY.

Here represented by a few herbs with tubular or funnel-form calyx colored like a corolla, and falling away from a persistent lower portion which closes completely over the 1-celled 1-ovuled ovary and seed-like fruit, forming a hard and dry covering which would be mistaken for a true pericarp. Stamens 2–5, the long slender filaments hypogynous, but apt to adhere somewhat to the sides of the calyx tube above. Embryo coiled around some mealy albumen. (Lessons, Figs. 52–55.) Ours are herbs, with opposite, simple, entire or wavy leaves, and jointed stems, tumid at the joints.

* *Involucral bracts wholly distinct.*

1. ABRONIA. Flowers small, many in a peduncled umbel-like head surrounded by an involucre of about 5 bracts. Calyx salver-shaped, with a slender tube, and a corolla-like 5-lobed border, which is plaited in the bud, the lobes generally notched at the end. Stamens 5 and style included.

* * *Involucral bracts united at the base.*

2. OXYBAPHUS. Flowers small, a few together surrounded by a 5-lobed involucre, which enlarges and becomes thin, membranaceous, reticulated, and wheel-shaped after flowering. Calyx with a very short tube constricted above the ovary, expanding into a bell-shaped 5-lobed corolla-like border, open only for a day. Stamens (mostly 3) and slender style protruding. Fruit (persistent base of calyx) akene-like, strongly ribbed.
3. MIRABILIS. Flower large, in the common species only a single one in the cup-shaped 5-cleft green involucre, which thus exactly imitates a calyx, as the tubular funnel-shaped or almost salver-shaped delicate calyx does a corolla. 5 stamens, and especially the style (tipped with a shield-shaped stigma) protruded. Fruit ovoid, smooth and nearly even.

1. ABRÒNIA. (Greek: *graceful.*) Western North American herbs, cultivated for ornament; flowers all summer. ♃

* *Flowers rose-purple.*

A. umbellàta, Lam. Cal.; prostrate slender stems, ovate-oblong slender petioled leaves, and flowers open by day, the involucre of small bracts.

* * *Flowers white.*

A. frágrans, Nutt. Stems ascending, branching; leaves lance-ovate; flowers sweet-scented, opening at sunset; the involucre of conspicuous, ovate, scarious and whitish bracts. W. Iowa, W.

* * * *Flowers yellow.*

A. arenária, Menzies. Leaves thick, ovate to reniform; plant glandular. Cal.

2. **OXÝBAPHUS.** (Greek, for a *vinegar saucer*, from the shape of the involucre.) ♃ Flowers rose-purple, all summer.

* *Plant glandular; leaves sessile or nearly so.*

O. álbidus. Sweet. S. Car., S.; hairy or pubescent above; leaves acute at base, lanceolate or oblong; fruit hairy; stem 4-angled.

O. hirsùtus, Sweet. Glandular-hirsute, especially at the joints and inflorescence, 1°–3°; leaves lanceolate or narrower, cuneate at the base; fruit with obtuse angles. Wis., S. W.

* * *Plant not, or very little, glandular; leaves distinctly petioled or else linear.*

O. nyctagíneus, Sweet. Much branched, 1°–3°, nearly smooth; leaves lanceolate to ovate; inflorescence loose and but slightly pubescent; fruit acutish-angled. Minn. and Wis., S.; also cult., and sometimes escaped.

O. angustifòlius, Sweet. Tall, glabrous, or the peduncles and involucres hirsute; leaves linear, thick and glaucous, 2′–6′ long. Minn., S.

3. **MIRÁBILIS,** FOUR-O'CLOCK or MARVEL OF PERU. (Clusius called it *Admirabilis*, which Linnæus shortened.) Natives of warm parts of America; roots often very large and fleshy; leaves more or less heart-shaped, the lower petioled; flowers mostly clustered, showy, opening towards sunset or in cloudy weather, produced all summer. ♃

M. Jalápa, Linn. Common F. Cult. for ornament in many varieties of flowers (red, yellow, white, or variegated), its tube only 2′ long, and thickish; stamens shorter than its spreading border; whole plant nearly smooth; inodorous.

M. longiflòra, Linn. Less common in cult.; tube of the sweet-scented flower 6′ long and clammy-hairy (as well as the upper leaves); stamens shorter than its spreading white border.

XCII. ILLECEBRACEÆ, KNOTWORT FAMILY.

Ours small and unimportant herbs, often united with the Pink Family, having mostly opposite and entire, often linear leaves, scarious stipules (0 in Scleranthus), calyx 4–5-toothed or -parted and persistent, stamens borne on the calyx and as many as its lobes (then opposite the lobes) or fewer, styles 2, distinct or united, and utricle 1-seeded. Flowers small, whitish or greenish; plants tufted or diffuse; staminodia sometimes present.

* *Styles united; stamens borne on the base of the calyx.*

1. ANYCHIA. Sepals awnless. Stamens 2–3, or only rarely 5. Stigmas 2, sessile. Utricle exceeding the calyx.
2. PARONYCHIA. Sepals awned. Stamens 5. Staminodia sometimes present in the form of minute teeth or bristle-like bodies. Utricle inclosed in the calyx.

* * *Styles distinct; stamens on the throat of the calyx.*

3. SCLERANTHUS. Stamens 5–10. Utricle inclosed in the indurated calyx cup.

1. ANÝCHIA, FORKED CHICKWEED. (Name derived from the same root as the next.) Diffuse, forking plants, in dry soil. ①

A. dichótoma, Michx. Somewhat pubescent, 6′–10′ high, with repeatedly forking short-jointed stems, minute, short-stalked, greenish flowers in the forks, and narrow-lanceolate or oblanceolate leaves; flowers clustered and nearly sessile; all summer.

A. capillàcea, DC. Smooth, with longer joints and more slender and erect; leaves thinner and broader; flowers stalked, in diffuse inflorescence. N. Eng., W. and S., with the last.

2. PARONÝCHIA, WHITLOW-WORT. (Greek: a *whitlow*, and a plant supposed to cure the disease.) Tufted, with minute flowers and silvery dry stipules.

* *Flowers axillary and solitary.* ①

P. herniarioìdes, Nutt. Rough-pubescent; stems diffuse and prostrate; leaves oval or oblong and mucronate; sepals awl-like. Dry sand ridges, N. Car., S.

* * *Flowers in clusters.* 2ℓ

P. argyrócoma, Nutt. Minutely-pubescent; forming broad, spreading tufts on bare mountains of White Mts., and S., in the Alleghanies to Ga., and on the seacoast, Mass., N.; leaves linear; flowers in dense clusters and concealed by large silvery bracts; calyx hairy, the sepals short-awned; staminodia minute teeth between the stamens.

P. dichótoma, Nutt. On rocks, Md., S.; smooth and ascending; leaves and bracts narrow-awl-shaped; cymes open and forked; sepals short-pointed; staminodia bristle-like.

3. SCLERÁNTHUS, KNAWEL. (Greek: *hard flower*, referring to the indurated tube of the calyx.)

S. ánnuus, Linn. Nat. from Eu., in gravelly grounds, around gardens and in lawns; a very pale little herb, 3′–5′ high, very much branched and spreading, with short awl-shaped leaves, and greenish small flowers clustered or sessile in the forks, in late summer and autumn. ①

XCIII. AMARANTACEÆ, AMARANTH FAMILY.

Weeds and some ornamental plants, chiefly herbs, essentially like the next family, but the flowers provided with dry and mostly scarious crowded persistent bracts, and the fruit sometimes several-seeded. The filaments are often united into a tube or cup. The cultivated sorts are ornamental, like Immortelles, on account of their colored dry bracts which do not wither.

* *Leaves alternate, mostly long-petioled; anthers 2-celled.*

+ *Flowers perfect; ovules and seeds numerous.*

1. CELOSIA. Nearly as Amarantus, but the crowded spikes imbricated with shining colored bracts. In cultivation the spikes are often changed into broad crests.

+ + *Flowers dicœcious, monœcious, or polygamous; ovule solitary.*

2. AMARANTUS. Flowers monœcious or polygamous. Calyx of 5, or sometimes 3, equal erect sepals, glabrous. Stamens 5, sometimes 2 or 3. Stigmas 2 or 3. Ovule on a stalk from the base of the ovary. Fruit an utricle, 2–3-pointed at apex, usually opening all round transversely, the upper part falling off as a lid (Lessons, Fig. 387), discharging the seed. Flowers in axillary or terminal spiked clusters. Bracts 3 at each flower.

3. ACNIDA. Flowers dicœcious, the pistillate ones without a calyx. Sterile flowers with 5 stamens and 5 sepals. Stigmas 2–5, often plumose. Bracts 1–3.

* * *Leaves opposite; anthers 1-celled.*

+ *Flowers capitate, the heads either axillary or terminal.*

4. TELANTHERA. Flowers perfect, in small dense heads (axillary in ours). Calyx 5-parted, the divisions unequal. Anther-bearing stamens 5, alternating with 5 sterile filaments of the same length and which are laciniate at the top, all united into a short tube. Stigma capitate.

5. GOMPHRENA. Flowers perfect, chiefly in terminal round heads, crowded with the firm colored bracts. Calyx 5-parted or of 5 sepals, the parts nearly equal. Stamens 5, monadelphous below, the filament tube elongated. Stigmas 2 or 3, subulate or filiform. (Lessons, Fig. 299.)

+ + *Flowers spicate or paniculate.*

6 FRŒLICHIA. Flowers perfect, 3-bracted, in spikes. Calyx tubular, 5-cleft at the summit, inclosing the fruit. Filaments united into a tube, bearing 5 anthers and as many sterile appendages.

7. IRESINE. Flowers generally dicœcious or polygamous, 3-bracted, in panicles. Sepals 5. Stamens generally 5, with the filaments united in a cup below.

1. CELÒSIA, COCKSCOMB. (Greek: *dried* or *burnt*, alluding to the scarious bracts.) Flowers summer. ①

C. cristàta, Linn. COMMON C. Of the gardens, from the Tropics, in various usually monstrous forms, the showy flower crests crimson-red, sometimes rose-colored, yellow, or white.

2. AMARÁNTUS, AMARANTH. (From Greek for *unfading*.) Coarse weeds of cult. and waste grounds, and one or two cultivated for ornament. Flowers late summer. Bracts commonly awn-pointed. ①

* RED AMARANTHS, *the flower clusters or the leaves tinged with red or purple (except sometimes in the last).*

+ *Spikes drooping.*

A. caudàtus, Linn. PRINCE'S FEATHER. Cult. from India; tall, stout; leaves ovate, bright green; spikes red, naked, long and slender, in a drooping panicle, the terminal one forming a very long tail.

+ + *Spikes erect.*

A. hypochondrìacus, Linn. Cult. from Trop. Amer.; stout; leaves oblong, often reddish-tinged; flower clusters deep crimson-purple, short and thick, the upper making an interrupted blunt spike.

A. paniculàtus, Linn. Coarse weed in gardens; the oblong-ovate or lance-oblong leaves often blotched or veined with purple; flowers in

rather slender purplish-tinged spikes collected in a terminal panicle. Trop. Amer.

A. Gangèticus, Linn. Cult. from E. Asia in many forms, usually under the name A. MELANCHÓLICUS or LOVE-LIES-BLEEDING, or in the form (used for carpet bedding) with foliage marked with red, violet, or yellow, as A. TRÍCOLOR. Often rather low, the stems and stalks red; leaves ovate and thin, petioled, dark purple or partly green; or in a form grown by the American Chinese as a pot herb, the herbage is entirely green. Flowers mostly glomerate, on axillary and terminal branches.

* * GREEN AMARANTHS, *with the inflorescence and leaves green or nearly so.*

+ *Plant not spiny.*

++ *Tall and erect.*

A. retrofléxus, Linn. PIGWEED, BEETROOT. A weed everywhere in cultivated lands, with a slender red root; roughish or pubescent, the leaves ovate or rhomb-ovate, with more or less undulate margins, long-petioled, dull green, entire; spikes thick and crowded into a stiff or bunchy panicle; sepals acute or obtuse. Trop. Amer.

A. chloróstachys, Willd., also a common weed, is smoother and deeper green, and has slender or flexuose spikes which are more spreading; sepals generally sharper. Trop. Amer.

++ ++ *Decumbent or low and diffuse.*

A. álbus, Linn. TUMBLEWEED. Pale green and smooth, the plant low and diffusely branched, in autumn often forming a ball-like mass and rolling before the wind; leaves obovate and spatulate; flowers all in small clusters in their axils and covered by rigid sharp-pointed bracts; sepals 3; stamens 2 or 3. Common in waste grounds.

A. blitoìdes, Watson. Wild W. of the Mississippi and becoming a weed along roadsides and railroads E.; prostrate or decumbent, often reddish, forming a mat; spikes narrow; bracts short-acuminate; seed larger than in the last.

+ + *Plant with a pair of spines in the axil of each leaf.*

A. spinòsus, Linn. THORNY A. Waste ground, chiefly S.; leaves dull green, rhomb-ovate or ovate-lanceolate; flowers small, yellowish-green, in round axillary clusters and in a long terminal spike. Trop. Amer.

3. ACNÌDA, WATER HEMP. (Greek for *nettle*.) Three or four confused species in our territory. The commonest are

A. cannábina, Linn. Salt marshes along the coast; a tall annual, like an Amaranth; bracts inconspicuous, and the fleshy indehiscent fruit 3–5-angled and crested; leaves lanceolate or narrower, acuminate and long-stalked; fruit indehiscent.

A. tuberculàta, Moq. In wet places, Mich., W. and S., not in salt marshes; generally tall and erect (low and decumbent forms) with lanceolate, acute, or obtuse leaves, and regularly dehiscing fruit; pistillate flowers in dense clusters, in naked or leafy terminal spikes. ①

4. TELANTHÈRA. (Greek: *complete anthers*, referring to the 10 bodies being equal.)

T. Bettzichiàna, Regel. (ALTERNANTHÈRA PARONYCHIOÌDES of gardeners). A familiar bedding and edging plant from S. Amer.; compact, only a few inches high, with narrow spatulate or oblanceolate leaves, which are blotched with orange, red, or crimson, or shaded with dull purple. ①

5. GOMPHRÈNA. (Ancient name of an Amaranth.) Flowers summer.

G. globòsa, Linn. GLOBE AMARANTH or BACHELOR'S BUTTON. Cult. from India, for the dry Clover-like heads, which are used as Immortelles; low, branching, pubescent, with oblong, nearly sessile leaves, and dense round heads crimson, rose-color, or white. ①

6. FROELÍCHIA. (*J. A. Frœlich*, a German botanist of the last century.)

F. Floridàna, Moq. Stem 1°–3°, leafless above; leaves lanceolate, silky beneath; flowers in spikelets, which are crowded into an interrupted spike-like inflorescence; calyx very woolly. Sandy dry places, Minn., S. ①

7. IRESÌNE. (Greek name of a wreath or staff entwined with fillets of wool, referring to the habit of the calyx, in some species, of bearing long wool.) ①

I. Hérbstii, Hook. (ACHYRÁNTHES VERSCHAFFÉLTII of gardens). Common plant in conservatories, and bedded out in summer like Coleus, of many colors of leaves; erect, 1°–2°, with very roundish or kidney-shaped, smooth, glossy-red stems; leaves opposite, somewhat cordate, generally notched at the top, long-petioled, the nearly opposite conspicuous veins curving off from the midrib; flowers white and small, in a loose terminal panicle. Brazil.

I. celosioìdes, Linn. Erect and slender, 2°–4°, nearly glabrous; leaves ovate-lanceolate; silver-white flowers in naked and slender panicles. Dry banks, Ohio, W.

XCIV. CHENOPODIACEÆ, GOOSEFOOT FAMILY.

Represented chiefly by homely herbs, with inconspicuous greenish flowers with no dry bracts. The 1-celled ovary has a single ovule and ripens into an akene or utricle, containing a single seed, usually with embryo coiled more or less around mealy albumen. Leaves chiefly alternate. Plants neither attractive nor easy to students; only the cultivated plants and commonest weeds here given. Calyx sometimes fleshy. The Madeira Vine (Boussingaùltia baselloìdes, HBK.) belongs in this family.

** Plant not fleshy nor jointed; leaves not spiny.*

+ Leaves flat, with a distinct limb, generally broad.

++ Flowers bractless.

1. CYCLOLOMA. Flowers very small, perfect or sometimes the stamens 0. Calyx 5-cleft, the lobes strongly keeled and becoming winged and inclosing the depressed fruit. Coarse herb with alternate and sinuate petioled leaves, and flowers sessile in an open panicle. Styles 3. Stamens 5.
2. SPINACIA. Flowers dicœcious, in axillary close clusters; the staminate ones racemed or spiked, consisting of a 4–5-lobed calyx and as many stamens. Pistillate flowers with a tubular calyx which is 2–3-toothed at the apex and 2–3-horned on the sides, hardening and inclosing the akene. Styles 4. Stamens 4–5.

3. CHENOPODIUM. Flowers perfect in small clusters collected in spiked or sometimes open panicles. Calyx mostly 2–5-cleft, dry or succulent in fruit. Ovary and utricle depressed. (Lessons, Fig. 386.) Styles 2, rarely 3. Stamens 1–5.

++ ++ *Flowers with bracts (or, if imperfect, the staminate ones bractless).*

4. BETA. Flowers perfect, clustered, with 3 bracts and a 5-cleft calyx becoming indurated in fruit, inclosing the hard akene, the bases of the two coherent. Stamens 5. Style short; stigmas mostly 2.

5. ATRIPLEX. Flowers monœcious or diœcious, the staminate like those of 3, except that the pistil is abortive, the pistillate comprising a single naked pistil (sometimes calyx-bearing in the garden Orach), inclosed in a pair of leafy mostly mealy bracts which are enlarged in fruit and sometimes united. Stamens 3–5.

+ + *Stem leaves linear awl-shaped, with no distinct petiole.*

6. CORISPERMUM. Flowers perfect, single, sessile in the axils of the upper leaves or bracts. Calyx a single small sepal on the inner side of the flower. Styles 2. Stamens 1–2.

* * *Plant more or less fleshy, often spinescent, growing on the seacoast or in saline soils.*

+ *Leaves apparent, alternate; stem not jointed.*

7. SUÆDA. Flowers perfect, in the axils of leafy bracts, sessile. Calyx fleshy, 5-parted, often crested but wingless, inclosing the utricle. Stigmas 2–3. Stamens 5. Leaves soft.

8. SALSOLA. Flowers perfect. Calyx 5-parted, the divisions inclosing the fruit and finally becoming horizontally winged. Styles 2. Stamens generally 5. Leaves stiff and spinescent.

+ + *Leaves reduced to opposite fleshy scales; stem terete and jointed.*

9. SALICORNIA. Flowers perfect, in 3's (the lateral sometimes sterile), immersed in hollows of the upper joints and forming a narrow strict spike. Calyx small and somewhat inflated, becoming spongy and inclosing the flattened utricle. Styles 2. Stamens 1–2.

1. CYCLOLÒMA, WINGED PIGWEED. (Greek: *circle, border,* from the encircling wing of the calyx.) ①

C. platyphýllum, Moq. A diffuse herb, 6′–20′, webby-pubescent or nearly glabrous, green or purplish, often becoming a tumble weed in the fall. Sandy soils, Minn., S.

2. SPINÀCIA, SPINACH, SPINAGE. (Latin for *spine* or *thorn,* from the horns or projections on the fruiting calyx of one variety.)

S. oleràcea, Mill. Common Spinach. Cult. from the Orient, as a pot herb; the soft fleshy leaves triangular or ovate and petioled. ① ②

3. CHENOPÒDIUM, GOOSEFOOT (which the name denotes in Greek in reference to the shape of the leaves of some species), PIGWEED. Weeds; flowers late summer and autumn.

* Blite. *Calyx fleshy in fruit, generally colored, the dense clusters of flowers showy and berry-like.*

C. capitàtum, Watson. Strawberry Blite, Strawberry Spinach. Flower heads as the fruit matures becoming bright red and juicy, like strawberries; leaves triangular and halberd-shaped, wavy-toothed, smooth and bright green. Dry banks, margins of woods, etc., N., sometimes in gardens as a pot herb. ② ①

* ⁘ PIGWEEDS, etc. *Plant mealy or glabrous, never hairy or aromatic.*

+– *Leaves narrow, entire or somewhat sinuate-dentate; pericarp easily separating from the seed.*

C. Bosciànum, Moq. From N. Y., W. and S.; erect, 2°, and slender, nearly glabrous; leaves oblong or linear-lanceolate, narrowed into a slender petiole; flowers in small clusters or solitary. ①

+– +– *Leaves broader and (in ours) prominently sinuate or lobed; pericarp persistent.*

+– ♃ *Leaves triangular-hastate.*

C. Bònus-Henrìcus, Linn. GOOD-KING-HENRY. MERCURY (sometimes degenerated into "MARKERY"). Cult. in some old gardens as a pot herb, and sparingly escaped; slightly mealy; calyx fully inclosing the fruit, the seed vertical; leaves triangular and partly halberd-shaped; flower clusters crowded in an interrupted terminal spike. Eu.

+– +– ① *Leaves not hastate.*

= *Plant erect, mostly tall.*

‖ *Foliage bright green, the leaves thin.*

C. hýbridum, Linn. MAPLE-LEAVED P. Waste grounds; unpleasantly scented like Stramonium, bright green throughout; the widely branching stem 2°–4° high; the thin large leaves triangular and heart-shaped, sinuate and angled, the angles extended into a few taper-pointed coarse teeth; racemes in loose and leafless panicles; calyx lobes keeled.

C. muràle, L. Loosely branched, lower; leaves rhomboid-ovate and acute, coarsely and sharply unequally toothed; spikes or racemes diverging; calyx lobes scarcely keeled. N. Eng., W. and S. Eu.

‖ ‖ *Foliage more or less white-mealy, particularly beneath, the leaves thickish.*

C. úrbicum, Linn. Only slightly mealy, erect-branched, 1°–3°; leaves triangular and acute, coarsely and sharply many-toothed; erect spikes crowded in a long narrow panicle; calyx lobes not keeled. Throughout. Eu.

C. álbum, Linn. COMMON PIGWEED, LAMB'S-QUARTERS. One of the commonest of weeds, in all cultivated grounds, and variable; erect, 1°–10°; leaves rhomb-ovate to lanceolate, at least the lower ones angular-toothed; spikes dense and panicled; calyx lobes strongly keeled. Eu. (Lessons, Fig. 386.)

= = *Plant spreading, mostly prostrate on the ground.*

C. glaùcum, Linn. A foot or less high, glaucous and mealy; leaves sinuate-toothed or pinnatifid, obtuse; flowers in axillary spiked clusters. Frequent. Eu.

* * * AROMATIC GOOSEFOOTS. *Minutely glandular or pubescent, aromatic-scented; not mealy or scurfy; the seed sometimes vertical.* ① ②

C. Bòtrys, Linn. JERUSALEM OAK or FEATHER GERANIUM. Gardens and some roadsides; low, spreading, almost clammy-pubescent, sweet-scented; leaves sinuate-pinnatific, slender-petioled; racemes loosely corymbed. Eu.

C. ambrosioìdes, Linn. MEXICAN TEA, WORMSEED. Waste grounds, especially S.; rather stout, smoothish, strong-scented; leaves oblong or lanceolate, varying from entire to cut-pinnatifid, nearly sessile; spikes dense, leafy or leafless. This, especially the more cut-leaved and elongated-spiked var. ***anthelmínticum***, Gray, is used as a vermifuge, and yields the *wormseed oil*. Trop. Amer.

4. BÈTA, BEET. (Latin name.) One species in cultivation, viz.: —

B. vulgàris, Linn. COMMON BEET. From S. Eu.; cult. in many varieties, with ovate-oblong, smooth, often wavy-margined leaves, sometimes purple-tinged; flower clusters spiked; root conical or spindle-shaped. MANGEL-WURZEL is a variety, the large root used for feeding cattle. SWISS CHARD is a form with broad petioles, used as a pot herb. There are also ornamental-leaved forms. ②

5. ÁTRIPLEX, ORACH. (Latin, from the Greek, *not nourishing*.) ①

* *Upright or erect, green.*

A. horténse, Linn. ORACH. Tall and strict (3°–4°); leaves cordate-ovate and large, sinuate-notched, or those near the inflorescence becoming lance-ovate and entire, all slender-petioled; flowers in a large terminal panicle, the heart-shaped fruiting bracts conspicuous and often colored. Old World. Sometimes cult. as a substitute for Spinach.

A. pátulum, Linn. Erect or sometimes prostrate, glabrous or slightly scurfy; leaves narrowly lanceolate-hastate, entire or somewhat sinuate-dentate, petioled, the lower ones sometimes opposite, the uppermost becoming linear; bracts triangular-ovate or rhombic-hastate. Generally distributed, and immensely variable in form of leaves.

* * *Diffusely spreading, white-mealy.*

A. arenàrium, Nutt. Leaves oblong and narrowed at the base, nearly sessile; bracts broadly wedge-form and united, 2–5-toothed. Coast, Mass., S.

6. CORISPÉRMUM, BUG-SEED (which the name means in Greek, from the oval, flat fruit.) ①

C. hyssopifòlium, Linn. In sands along the Great Lakes and W.; pale, diffusely branched, and sometimes becoming a tumble weed in fall, glabrous, or hairy when young; fruits wing-margined, in terminal interrupted spikes.

7. SUÆDA, SEA BLITE. (Arabic name.) Uninteresting saline plants, often running into perplexing forms.

S. lineàris, Moq. The only species in the East, is either erect or prostrate, 1°–2°, branched; leaves 2′ or less long, narrow at the base, not spine-like; bracts acuminate, on slender branchlets. Seacoast. ①

8. SÁLSOLA, SALTWORT. (Latin, *salty*.) ①

S. Kàli, Linn. Diffusely branched, rough or nearly smooth; leaves short, stiff and prickly-pointed, 2–4 times longer than the bracts; calyx often reddish, forming a beak-like body over the fruit, the wings thick and less prominent than the calyx lobes. Seashore, N. Eng., S.

Var. *Tràgus*, Moq. RUSSIAN THISTLE, RUSSIAN CACTUS. More bushy and rigid; leaves of mature plant only a little longer than the leaf-like bracts; calyx membranaceous and generally bright rose color, the wings much longer than the calyx lobes. Introd. into the Upper Miss. valley and the plains (also in N.Y.) from N. Eu., and now a pernicious weed.

9. SALICÓRNIA, GLASSWORT, SAMPHIRE. (Latin: *salt* and *horn*, from the habitat and the horn-like branches.)

S. mucronàta, Bigel. Erect and stout, naked below, becoming red; spikes thick, the scales conspicuous and pointed. Seacoast, Va., N. ①

S. herbàcea, Linn. Erect or spreading, green; spikes elongated and narrow, the scale obscure and very blunt. Salt places, along the coast and inland. ①

S. ambígua, Michx. Tufted, with long decumbent or ascending hard stems, greenish or lead color; spikes slender and short-jointed, the scales short or acutish. Seacoast, Mass. to Tex. ♃

XCV. PHYTOLACCACEÆ, POKEWEED FAMILY.

A small family of herbs or shrubs, with alternate and entire thin leaves and perfect flowers, the latter with the characters of the Goosefoot Family, except that the ovary is usually several-celled, the carpels united in a ring and (in ours) forming a berry.

1. RIVINA. Calyx 4-parted, colored like a corolla. Stamens 4–8. Ovary 1-celled. Stigma capitate, the style short. Herbs with a woody base and white or rose-colored flowers in axillary and terminal racemes.
2. PHYTOLACCA. Calyx of 5 rounded, petal-like, white sepals. Stamens 5–30. Ovary of several cells and lobes, bearing as many short styles, in fruit a depressed juicy berry, containing a ring of vertical seeds. Rank herb, with terminal (becoming lateral) racemes.

1. RIVÌNA. (*A. Q. Rivinus*, a German botanist, two hundred years ago.) ♃

R. hùmilis, Linn. Very finely pubescent or glabrous, 1°–2°; leaves oblong- or lance-ovate, long-petioled and acuminate, alternate; small whitish flowers in short racemes, followed by small oblong red berries. Cult. in greenhouses from Trop. Amer., for its ornamental fruit, and native in S. Fla.

2. PHYTOLÁCCA, POKEWEED, SCOKE. (Hybrid name, of Greek and French, referring to the crimson or *lake* coloring of the berries.) ♃

P. decándra, Linn. Common P. or Scoke, Garget, Pigeon Berry. Coarse smooth weed of low grounds, with large acrid-poisonous root, stout stems 6°–9° high, alternate ovate-oblong leaves on long petioles, and racemes becoming lateral opposite a leaf, in summer, ripening the dark crimson purple berries in autumn; stamens, styles, and seeds 10. Young shoots sometimes eaten as a pot herb.

XCVI. POLYGONACEÆ, BUCKWHEAT FAMILY.

Known by the alternate entire leaves having stipules in the form of scarious or membranous sheaths or ocreæ (sometimes obsolete) at the strongly marked usually tumid joints of the stem. Flowers mostly perfect, on jointed pedicels, with green or colored 3–6-parted usually persistent or withering calyx, 4–12 stamens on its base, 2 or 3 stigmas, 1-celled ovary with a single ovule rising from its base (Lessons, Figs. 342, 344), forming an akene or nutlet which is 2–4-angled or winged.

Embryo mostly on the outside of mealy albumen, the radicle pointing to the apex of the fruit. Juice acid or acrid.

* *Calyx of 6 sepals often of two sorts; styles 3.*

1. RHEUM. Sepals all similar, petal-like, withering-persistent underneath the 3-winged fruit. Stigmas capitate or wedge-shaped. Stamens 9.
2. RUMEX. Sepals of 2 sorts; the 3 outer ones herbaceous and at length spreading; the alternate inner 3 larger, somewhat colored, enlarging after flowering, becoming veiny and dry, often bearing a grain-like tubercle on the back, and convergent over the 3-angled akene. Stigmas a hairy tuft. Stamens 6.

* * *Calyx of 5, rarely 4, more or less petal-like similar sepals, erect after flowering.*

3. POLYGONUM. Flowers in racemes, spikes, or else in the axils of the leaves. Akene either lenticular when there are 2 stigmas, or triangular when there are 3. Embryo curved round one side of the albumen; cotyledons narrow. Stamens 4–9.
4. FAGOPYRUM. Differs from one section of Polygonum mainly in having an embryo in the center of the albumen, which is divided into 2 parts by the very broad leaf-like cotyledons. The triangular akene longer than the calyx. Stamens 8.
5. POLYGONELLA. Flowers on solitary jointed pedicels (nodding in fruit) in slender panicled racemes. Leaves jointed at the base. Embryo slender and nearly straight, lying in one side of the albumen. Stamens 8.

1. RHÈUM, RHUBARB. (Greek, from *Rha*, the old Greek name of rhubarb.) Only the following species common; others are sometimes cult. for ornament.

R. Rhapónticum, Linn. (i.e., *Pontic Rha* or *Rheum*). GARDEN R. or PIE PLANT; the large fleshy stalks of the ample rounded leaves, filled with pleasantly acid juice, cooked in spring as a substitute for fruit; flowers white, in late spring, in tall panicles. Old World.

2. RÙMEX, DOCK, SORREL. (Old Latin name.) The three enlarged sepals which cover the fruit are called *valves*. Flowers greenish, in whorls on the branches, forming panicled racemes or interrupted spikes.

§ 1. DOCK. *Herbage bitter; flowers perfect or partly monœcious, in summer.*

* *In marshes; stem erect, stout; leaves lanceolate or lance-oblong, flat, not wavy; valves entire or obscurely wavy-toothed in the first species.* ♃

+ *Pedicels longer than the fruiting calyx.*

R. Británnica, Linn. GREAT WATER DOCK. Common N.; 5°–6° high; leaves often 1°–2° long, the margins obscurely erose-crenulate; flowers nodding on slender pedicels which are about twice the length of the fruiting calyx; the valves round-ovate or almost orbicular, very obtuse and obscurely cordate, thin, finely reticulated, nearly $\frac{1}{4}'$ wide, each bearing a grain. N. Eng. and N. J., W.

R. verticillàtus, Linn. SWAMP D. Common N.; 3°–5° high; fruit-bearing pedicels slender and club-shaped, abruptly reflexed, 3–4 times longer than the calyx; valves somewhat rhombic and with narrow blunt apex, each bearing a very large grain; leaves thickish, the lowest often heart-shaped at base; raceme long and nearly leafless, the whorls loose.

+ + *Pedicels shorter than the fruiting calyx.*

R. salicifòlius, Weinm. WHITE D. Salt marshes and lake borders; 1°–3° high; leaves narrowly or linear-lanceolate; pedicels much shorter

than the fruiting calyx and in much crowded whorls, forming a spike; valves triangular and small, one or all with a very large grain; root white. N. Eng. to Great Lakes and W.

R. altíssimus, Wood. Pale D. 2°–6° high; pedicels nodding, shorter than the fruiting calyx, which has broadly ovate, loosely reticulated valves, one with a large grain, the others commonly naked; root yellow. Moist grounds, N. J., W.

* * *Sandy seashore and river banks N.; 5′–12′ high, spreading.* ①

R. marítimus, Linn. Golden D. Minutely pubescent; leaves lance-linear, wavy-margined, the lower auricled or heart-shaped at base; whorls much crowded into leafy spikes; valves rhombic-oblong with a tapering point, turning orange-colored, a large grain on the back and 2 or 3 long stout bristles on each margin.

* * * *Weeds nat. from Eu. in cult. or waste ground; stem erect, 2°–4° high; lower leaves or some of them heart-shaped at base, all more or less wavy; root commonly yellow and spindle-shaped.* 2ℓ

+– *Valves conspicuously toothed at base, one (chiefly) grain-bearing.*

R. obtusifòlius, Linn. Bitter D. Leaves little wavy, the upper lance-oblong and acute, lower oblong-heart-shaped and obtuse; whorls loose and distant; valves ovate, partly halberd-shaped, usually only one grain-bearing.

+– +– *Valves entire or obscurely denticulate, one or more grain-bearing (or sometimes all naked in the last).*

++ *Leaves with wavy or crisped margins.*

R. crìspus, Linn. Curled D. Leaves green, lanceolate, very wavy-curled, the lower rather truncate than heart-shaped at base; whorls crowded in long racemes; valves rounded, heart-shaped, nearly entire, mostly grain-bearing. Hybridizes with R. obtusifolius.

R. sanguíneus, Linn. Bloody-veined or Red D. Leaves red-veined, less curled, lanceolate or oblong, often fiddle-shaped; whorls distant, in long slender and leafless spikes; pedicels very short, jointed at the base; valves narrowly oblong and obtuse, one or more grain-bearing.

R. conglomeràtus, Murray. Smaller Green D. Like the last, but the panicle leafy, the leaves never fiddle-shaped, the pedicels jointed below the middle, the valves acutish and all grain-bearing. Moist grounds.

++ ++ *Leaves not curly- nor wavy-margined.*

R. Patiéntia, Linn. Patience D., Herb Patience. Very tall and strong species, cult. as a pot herb and sparingly escaped; leaves large, ovate-oblong or lanceolate and often broadest above the middle; valves very large and thin (3″ or more broad), one bearing a small grain, or its midrib thickened at the base.

§ 2. Sorrels. *Herbage acid; some leaves halberd-shaped, others with entire narrowed base; flowers dicœcious, small, in a terminal naked panicle; valves naked; flowers spring and summer.* 2ℓ

R. Acetosélla, Linn. Common or Sheep Sorrel. Low weed in all sterile fields; leaves lance-oblong or halberd-shaped, the lobes or auricles narrow; pedicels jointed with the flower; ovate valves hardly enlarging in fruit. Eu.

R. Acetòsa, Linn. Strong and tall (1°–3°); leaves auriculate at the base, the radical ones broad and very obtuse and on long slender stalks, the cauline long-oblong-lanceolate; inner valves orbicular and enlarging in fruit, the small outer ones reflexed. Cult. as a spring vegetable, and sparingly escarped E. Eu.

3. POLÝGONUM, KNOTWEED, JOINTWEED. (Greek: *many-jointed.*) Chiefly weeds; some with rather showy flowers; the following are the commonest; flowers late summer and autumn.

§ 1. *Flowers along the stem, nearly sessile in the axils of the almost sessile linear or oblong leaves, small, greenish-white; sheaths scarious, usually cleft or torn and fringed.*

* *Stems leafy throughout.*

P. marítimum, Linn. Glaucous, prostrate, the stems stout and short-jointed; leaves oval to linear-oblong, thick, surpassing the nodes; stipules very prominent. Seacoast, Mass., S. 2 ①

P. aviculàre, Linn. Common Knotweed or Doorweed. Generally prostrate or creeping, bluish-green, growing everywhere in hard soils about yards, the stems and roots strong; leaves small, oblong or lanceolate, acute or acutish; sepals very small, green and pinkish. ①

P. eréctum, Linn. Erect or ascending, loose in habit, 1°–2°; leaves oblong or oval and obtuse; flowers larger than in the last, on more evident pedicels. Roadsides. ①

* * *Stems with much reduced or bract-like leaves above.*

P. ramosíssimum, Michx. Nearly erect, much branched, and rigid striate stems 2°–4° high; lanceolate or linear leaves tapering into a petiole, and a glossy akene; sepals 6 and stamens 6 or 3, or else sepals 5 with 4 or 5 stamens. Mass., W. ①

P. ténue, Michx. Slender, upright, with thread-like branches, along which the upper flowers form a loose leafy spike; leaves narrow linear, acute; akene shining. Dry soil, N. Eng., S. and W. ①

§ 2. *Flowers collected in terminal spikes or spike-like racemes, rose-purple or flesh-color, or rarely white or greenish.*

* *Leaves lanceolate, oblong, or ovate, chiefly petioled; sheaths cylindrical; flowers several from each bract of the spike, 5-parted.*

+ *Sheaths and bracts not ciliate (except rarely in the first) nor fringed, the sheaths without a border; sepals not punctate; style 2-cleft.*

++ ① *Spikes narrow or loose; leaves narrow.*

P. lapathifòlium, Linn. Tall, 1°–6° high; leaves tapering from near the base to a narrow point (4′–12′ long); glabrous, or the peduncles rough with scattered sessile glands; spikes linear, nodding; flowers flesh-color or pale rose; the 6 stamens and 2 styles included; akene flat, with concave sides. Wet places, N. Eng., W. Very variable, one form (var. **incànum**) with leaves hoary beneath.

P. Pennsylvánicum, Linn. Stems 1°–3° high, the branches above and peduncles bristly with stalked glands; spikes oblong, short and blunt, erect; flowers rose-purple; stamens 8, a little protruding; style 2-cleft; akene with flat sides. Common in moist places.

++ ++ 2 *Spikes usually heavy and dense; leaves broad.*

P. amphíbium, Linn. Water P. Chiefly N.; in water, stems rooting below, often simple, bearing a single ovate or oblong dense spike or head of pretty large and showy rose-red flowers; leaves rather thick, oblong, heart-oblong, lance-ovate or lanceolate, mostly long-petioled, often floating; stamens 5.

P. Muhlenbérgii, Watson. Decumbent or nearly erect, rough with short appressed or glandular hairs; leaves thinnish, broad-lanceolate and large, long-acuminate; spike 1′–3′ long. Generally in muddy places, N. Eng., W. and S.

+ + *Sheaths with an abruptly spreading leafy border (which sometimes falls off), or else the sheaths and bracts bristly-ciliate.*

++ *Style 2-cleft, and akene somewhat flattened; sepals not punctate.*

= 2↓ *Stem rooting at base, ascending.*

P. Hartwrìghtii, Gray. Stem very leafy, the leaves narrow and short-stalked; stems rough-hairy, at least on the sheaths and bracts; sheaths generally with a conspicuous, leafy border; flowers and fruit like P. amphibium. Wet or muddy places, N. Eng., W.

= = ① *Stems erect.*

P. Càreyi, Olney. Swamps from Penn., N. and E.; leaves narrowly lanceolate, roughish, tapering both ways; sheaths margined or ciliate; peduncles glandular, bristly; stamens 5.

P. orientàle, Linn. Prince's Feather. Gardens and cultivated grounds, from India; with large, ovate, pointed leaves, and 7 stamens; very tall, with ciliate or bordered sheaths, soft-hairy; flowers in cylindrical nodding spikes.

P. Persicària, Linn. Lady's Thumb. Nat. from Eu., near dwellings; about 1° high; upper face of leaves with a dark blotch near the middle; sheaths somewhat bristly-ciliate; spikes oblong, dense, erect, on naked peduncles; flowers greenish-purple; stamens mostly 6; style 2–3-cleft; akene either flattish or triangular.

++ ++ *Style generally 3-parted and the akene triangular; sepals mostly dotted.*

= *Herbage not acrid nor punctate with pellucid dots.*

P. hydropiperoìdes, Michx. Stems slender, rising out of shallow water, 1°–3° high; leaves narrowly lanceolate or lance-oblong; sheaths hairy and fringed with long bristles; spikes erect, slender; flowers small, pale or white; stamens 8; style 3-cleft; akene sharply triangular. Common. 2↓

= = *Herbage (smooth) pungently acrid; leaves and pale sepals marked with pellucid dots or glands, in which the acrid quality resides.*

P. àcre, HBK. Water Smartweed. Stems rooting at the decumbent base, rising 2°–4° high; leaves lanceolate or linear, taper-pointed; spikes slender, erect; flowers whitish or pale flesh-color; stamens 8; akene sharply triangular, shining. Common in wet places. 2↓

P. Hydrópiper, Linn. Common S. or Water Pepper. Low or wet grounds N.; 1°–2° high; leaves oblong-lanceolate; spikes nodding, mostly short; flowers greenish-white; stamens 6; akene either flat or obtusely triangular. ①

* * *Leaves ovate, short-petioled; sheaths cylindrical, fringed-hairy; greenish flowers 1–3 from each bract of the long and slender spikes, unequally 4-parted; the 2 styles reflexed on the lenticular akene and hooked at the tip.*

P. Virginiànum, Linn. Nearly smooth, 2°–4° high; leaves rough-ciliate, 3′–6′ long; flower somewhat curved; stamens 5. Frequent in thickets. 2↓

* * * *Leaves heart-shaped or arrow-shaped, petioled; sheaths half-cylindrical.*

+ Tear Thumb. *Stems with spreading branches, the angles and petioles armed with sharp reflexed prickles, by which the plant is enabled almost to climb; flowers in peduncled heads or short racemes, white or flesh-color.* ①

P. arifòlium, Linn. Low grounds; leaves halberd-shaped, long-petioled; the peduncles glandular-bristly; stamens 6; styles 2; akene lenticular.

P. sagittàtum, Linn. Low grounds; leaves arrow-shaped, short-petioled; the peduncles naked; stamens mostly 8; styles 3; akene sharply 5-angled.

+ + Black Bindweed. *Stems twining, not prickly; flowers whitish, in loose, panicled racemes; three outermost of the 5 divisions of the calyx keeled or crested, at least in fruit; stamens* 8; *styles* 3; *akenes triangular.*

P. Convólvulus, Linn. Black Bindweed. Low twining or spreading weed from Eu., in cultivated fields, etc.; smoothish, with heart-shaped and almost halberd-shaped leaves, and very small flowers. ①

P. cilinòde, Michx. Rocky shady places; tall-twining, rather downy; a ring of reflexed bristles at the joints; leaves angled-heart-shaped; outer sepals hardly keeled. 2/

P. dumetòrum, Linn., var. **scándens**, Gray. Climbing False Buckwheat. Moist thickets; tall-twining, 6°–12°, smooth; joints naked; leaves heart-shaped or approaching halberd-shaped; panicles leafy; outer sepals strongly keeled and in fruit irregularly winged. 2/

4. **FAGOPŸRUM**, BUCKWHEAT. (The botanical name, from the Greek, and the popular name, from the German, both denote *Beech-wheat*, the grain resembling a diminutive beech-nut.) Cult. from N. Asia, for the flour of its grain; flowers summer. ① (Lessons, Fig. 342, 344.)

F. esculéntum, Mœnch. Common B. Nearly smooth; leaves triangular-heart-shaped, inclining to halberd-shaped or arrow-shaped, on long petioles; sheaths half-cylindrical; flowers white or nearly so, in corymbose panicles; stamens 8, with as many honey-bearing glands interposed; styles 3; acutely triangular akene large.

F. Tatáricum, Gærtn. Tartary or Indian Wheat. Cult. for flour; like the other, but flowers smaller and tinged with yellowish; grain smaller, with its less acute angles wavy, dull, and roughish.

5. **POLYGONÉLLA**. (Diminutive of Polygonum.)

P. articulàta, Meisn. A slender little plant, bushy-branching, 4′–12′ high; leaves small and thread-like or at length none; the sheaths truncate, naked, rigid; many-jointed raceme with a single flower under each bract; flowers rose-colored, nodding; stamens 8; akene triangular. Sandy dry soils, on the coast, Me., S., and along the Great Lakes. ①

XCVII. ARISTOLOCHIACEÆ, BIRTHWORT FAMILY.

Known from all other apetalous orders by the numerous ovules and seeds in a 6-celled ovary, to which the lower part of the lurid calyx is adherent, the latter mostly 3-lobed, the stamens generally 6 or 12, and more or less united with the style. Anthers adnate and turned outwards. Calyx dull-colored, valvate in the bud. Leaves petioled, usually heart-shaped, not serrate. Flowers solitary, perfect, commonly large and odd. Bitter, tonic or stimulant, sometimes aromatic plants.

1. ASARUM. Low stemless herbs, with one or two leaves on long petioles, and a flower at the end of a creeping aromatic rootstock, the flowers therefore close to the ground. Calyx regular, with 3 equal lobes. Stamens 12, distinct, borne on the apex of the ovary or the base of the stout style, usually pointed beyond the anther. Seeds large, thickish, in a rather fleshy and irregularly bursting pod.
2. ARISTOLOCHIA. Leafy-stemmed herbs or woody twiners. Calyx tubular, variously irregular, often curved. Filaments none; anthers adherent directly and by their whole inner face to the outside of the 3–6-lobed stigma. Seeds very flat, in a dry 6-valved pod.

1. ÁSARUM, ASARABACCA, WILD GINGER. (Ancient name, of obscure derivation.) On hillsides in rich woods; flowers spring. 2ℓ

* *Filaments slender, much longer than the short anthers; style* 1, *thick, bearing* 6 *thick stigmas; leaves a single pair with a peduncle between them.*

A. Canadénse, Linn. CANADA WILD GINGER, sometimes called SNAKEROOT. Soft-pubescent; leaves broadly heart-shaped or kidney-shaped, not evergreen; calyx bell-shaped, but cleft down to the adherent ovary, brown-purple inside, the abruptly spreading lobes pointed. Rich woods, commonest N.

* * *Filaments short or almost none; anthers oblong-linear; styles* 6, *each* 2-*cleft, bearing the stigma below the cleft; leaves thick and evergreen, smooth, often mottled, usually only one each year; rootstocks in a close cluster.*

A. Virgínicum, Linn. VIRGINIA W. Along the Alleghanies, Va., S.; leaves small, rounded, heart-shaped; calyx tubular-bell-shaped with a somewhat narrowed throat and broad short lobes, the base coherent only with base of the ovary.

A. arifòlium, Michx. Va., S., has larger, somewhat halberd-shaped leaves, and very short and blunt lobes to the calyx.

2. ARISTOLÒCHIA, BIRTHWORT. (Ancient name, from medicinal properties.) Cells of the anthers in our species 4, in a horizontal row under each of the 3 lobes of the stigma, i.e., two contiguous 2-celled anthers in each set, or 6 in all. Flowers in and above the axils. Several curious species in greenhouses.

* *Flowers all next the root, curved like the letter S, contracted in the middle and at the throat.*

A. Serpentària, Linn. VIRGINIA SNAKEROOT (used in medicine). Rich woods, chiefly in Middle States and S.; low, downy herb; stems clustered, about 1° high; leaves ovate or oblong and heart-shaped, sometimes halberd-form, acute. 2ℓ

* * *Flowers from accessory axillary buds, strongly curved, contracted at the mouth.*

A. Sìpho, L'Her. PIPE VINE, DUTCHMAN'S PIPE (from the shape of the curved calyx). Rich woods from Penn., along the mountains S., and planted for arbors; very tall-climbing woody twiner, smooth, but the rounded heart-shaped leaves often downy beneath, these becoming 8′–12′ broad; peduncles with a clasping bract, drooping; calyx $1\frac{1}{2}'$ long, inflated above the ovary, narrowing above, contracted at the throat, the flat border brown-purple and obscurely 3-lobed; flowers late spring.

A. tomentòsa, Sims. A more slender woody climber, with smaller, rounder, and very veiny, downy leaves, and yellowish flower, with an oblique, almost closed, brownish orifice, the borders reflexed; flowers late spring or summer. N. C., S. and W.

XCVIII. PIPERACEÆ, PEPPER FAMILY.

Herbs (or the cultivated species sometimes woody) with alternate or opposite, entire leaves, and wholly naked generally perfect flowers in spikes, the ovary single or 3–5 together, and either separate or more or less united at the base, the ovules few in Saururus or only 1 in some other genera. Mostly tropical.

* *Ovary of 3–4 carpels slightly united at the base.*

1. SAURURUS. Stamens 6–8, hypogynous, the long white filaments distinct. Stigmas recurved. Leaves alternate.

* * *Ovary simple, 1-seeded.*

2. PIPER. Stamens 2–6, the anther cells generally distinct. Stigmas 3–5 (rarely 2). Leaves alternate.
3. PEPEROMIA. Stamens 2, the cells united in 1 2-valved cell. Stigma sessile. Leaves alternate, opposite, or verticillate.

1. SAURÙRUS, LIZARD'S TAIL. (Greek: *lizard-tail*, from the peduncled terminal spike.) 2*l*

S. cérnuus, Linn. Wet swamps and borders of brooks, Conn., W. and S.; stem jointed, 2° high, branching; leaves heart-shaped, with converging ribs, petioled; flowers white and fragrant, crowded in a dense but slender tail-like spike, with the end nodding. (Lessons, Fig. 234.)

2. PÌPER, PEPPER. (Ancient name.) A large genus of tropical plants, in greenhouses sometimes represented by

P. nìgrum, Linn. PEPPER PLANT. A trailing or climbing woody plant, with broadly ovate and acuminate petioled leaves; flowers in catkins 3′–6′ long, the fruit changing from green to red and black. E. Indies. BLACK PEPPER is the product of this plant. WHITE PEPPER is the same product with the external covering removed. CUBEBS are from P. CUBÉBA, of the E. Indies.

3. PEPERÒMIA. (Name means *Pepper-like.*) Many tropical species, of which several are in cultivation in greenhouses for their variously marked leaves, which are usually thick or somewhat succulent. Following are the commonest, all from S. Amer.

* *Leaves alternate.*

P. Sandérsii, C.DC. (P. VERSCHAFFÉLTII.) Leaves long-stalked, orbicular or cordate-ovate, thick, bright green along the veins and white between.

P. arifòlia, Miq. Leaves long-stalked, round-ovate, cordate or retuse-truncate at the base, thinnish, variegated with green and gray.

P. maculòsa, Dietr. Leaves broadly elliptic-ovate and very fleshy, bright green, the petioles spotted with purple.

* * *Leaves opposite.*

P. marmoràta, Hook. f. Leaves ovate and crowded, thick, with a rich green mottled and variegated with white.

XCIX. LAURACEÆ, LAUREL FAMILY.

Spicy-aromatic trees or shrubs, the alternate simple leaves (with entire margins but sometimes lobed) more or less marked with minute pellucid dots; the regular flowers with a calyx of 4 or 6 colored sepals imbricated in two ranks in the bud, and free from the ovary; the latter is terminated by a simple style and stigma, is 1-celled with a hanging ovule, and in fruit becomes a berry or drupe. The stamens furnish a special character, their anthers opening by uplifted valves. To this family belong the classical Laurel or Bay, the Cinnamon, the Camphor tree, etc.

* *Flowers perfect, in axillary panicles.*

1. PERSEA. Calyx 6-parted, persistent at the base of the berry. Stamens 12 with anthers, the 3 outer of which are turned outwards, 6 others inward, the remainder being 3 glands or sterile filaments forming an innermost row. The two proper cells of the anther, with a lower and an upper chamber, make 4 compartments, each opening by a valve in the manner of a trap-door.

* * *Flowers wholly or nearly dicecious, greenish-yellow; leaves deciduous.*

\+ *Anthers 4-celled and 4-valved.*

2. SASSAFRAS. Flowers in an open corymbed and peduncled cluster, with spreading 6-parted calyx; sterile ones with 9 stamens in 3 rows, the filaments of the three inner with a pair of yellow stalked glands on their base. Fertile flowers with 6 rudiments of stamens and an ovoid ovary, becoming a drupe.

3. LITSEA. Flowers in small lateral clustered umbels, with 6-parted deciduous calyx; sterile ones with 9 similar stamens; anthers turned inwards. Fertile flowers with a globular ovary, surrounded by numerous rudiments of stamens, and becoming a globular drupe or berry.

\+ \+ *Anthers 2-celled and 2-valved.*

4. LINDERA. Flowers in sessile lateral clusters, with a 6-parted honey-yellow calyx; sterile ones with 9 stamens; the inner 3 filaments lobed and glandular at base. Fertile flowers with a globular ovary, surrounded by numerous rudiments of stamens. Berry red, oval; the stalk not thickened.

1. PÉRSEA, RED BAY. (Ancient name of some Oriental tree.) Leaves evergreen; flowers greenish-white, in summer. The ALLIGATOR PEAR or AVOCADO of the tropics is P. GRATÍSSIMA.

P. Carolinénsis, Nees. CAROLINA RED BAY. Tree or large shrub, in low grounds, from Del., S.; hoary when young, the oblong leaves soon smooth above; berries blue on a red stalk.

2. SÁSSAFRAS. (The popular name of this very well-known tree.)

S. officinàle, Nees. SASSAFRAS. A fine tree, with mucilaginous yellowish twigs and foliage, spicy bark, flowers appearing in spring with the leaves; these ovate and obovate, and some of them 3-cleft, smooth when old; fruit blue on a club-shaped, rather fleshy stalk. Sandy or sterile land, Mass., W. and S.

3. LÍTSEA. (Chinese name.)

L. geniculàta, Benth. & Hook. POND SPICE. Along ponds in pine barrens from Va., S.; large shrub, soon smooth, with forking and diver-

gent or zigzag branches, rather coriaceous oval or oblong leaves ($\frac{1}{2}'$–$1'$ long), appearing later than the flowers in spring; these in little crowded clusters of 2–4 from 2–4-leaved involucres; fruit red, globular.

4. **LÍNDERA**, SPICEBUSH, WILD ALLSPICE, FEVERBUSH. (*John Linder*, a Swedish botanist.) Shrubs; flowers in spring, preceding the leaves.

L. Benzòin, Blume. Common S. or Benjamin Bush. Damp rich woods N. Eng., W. and S.; 6°–15° high, almost smooth; leaves thin, obovate-oblong, acute at base, 3′–5′ long.

L. melissæfòlia, Blume. Wet grounds, N. Car., W. and S.; 2°–3° high, silky-pubescent; leaves oblong, obtuse or slightly heart-shaped at base, $1'$–$2'$ long; when old, smooth above.

C. THYMELÆACEÆ, MEZEREUM FAMILY.

Shrubs with acrid and very tough fibrous bark, entire leaves, and perfect flowers with a simple corolla-like calyx, bearing twice as many stamens as its lobes (usually 8), the anthers of the ordinary sort; the free ovary 1-celled, with a single hanging ovule, becoming a berry-like fruit. Flowers commonly in umbel-like clusters.

1. DIRCA. Calyx tubular, without any spreading lobes, the wavy-truncate border sometimes obscurely indicating 4 teeth. The 8 stamens and the style long and slender, protruding.
2. DAPHNE. Calyx salver-shaped or somewhat funnel-shaped; the 4 lobes spreading, the 8 anthers nearly sessile on its tube, included. Style very short or none; stigma capitate.

1. **DÍRCA**, LEATHERWOOD, MOOSEWOOD. (Name obscure.)

D. palústris, Linn. Shrub 2°–6° high, with tender white wood, but very tough bark, used by the Indians for thongs (whence the popular names), the numerous branches as if jointed; leaves obovate or oval, alternate, nearly smooth, deciduous; flowers before the leaves in earliest spring, honey-yellow, few in a cluster from a bud of 3 or 4 dark-hairy scales forming an involucre; berry reddish. Rich damp woods; common N. and S.

2. **DÁPHNE**. (Mythological name, the nymph transformed by Apollo into a Laurel.) The following are cult. for ornament.

* *Leaves deciduous.*

D. Mezèreum, Linn. Mezereum. Hardy low shrub from Eu.; 1°–3° high, with purple-rose-colored (rarely white) flowers, in lateral clusters on shoots of the preceding year, in early spring, before the lanceolate very smooth green leaves; berries red.

* * *Leaves evergreen.*

D. Cneòrum, Linn. Hardy under-shrub from Eu., spreading and branching, with crowded lance-oblong or oblanceolate leaves (less than $1'$ long), and a terminal cluster of handsome rose-pink flowers in spring.

D. odòra, Thunb. (D. Japónica and D. Sinénsis). Sweet Daphne. Greenhouse shrub from China, with bright green, lance-oblong leaves, and terminal clusters of white or pale pink sweet-scented flowers, in winter.

CI. ELÆAGNACEÆ, OLEASTER FAMILY.

Silvery-scurfy shrubs or small trees, often having diœcious inconspicuous flowers, the calyx tube of the fertile ones itself inclosing the ovary, becoming fleshy and ripening into a sort of berry around the akene-like true fruit, the seed of which is erect. Otherwise much like the preceding family. Leaves entire.

1. ELÆAGNUS. Flowers perfect and axillary, with a 4-cleft calyx (the border deciduous). Stamens 4, inserted on the throat. Style linear, the stigma on the side. Fruit drupe-like, containing a long 8-grooved stone. Leaves alternate.
2. SHEPHERDIA. Flowers diœcious, the calyx 4-cleft and, in the pistillate flowers, inclosing the ovary. Stamens 8, alternating with 8 projections on the disk. Style slender. Fruit berry-like. Leaves opposite.

1. ELÆÁGNUS, OLEASTER. (Greek: *sacred olive*, first applied to the Chaste tree.) Small trees or bushes, with light or white foliage.

* *Pedicels much longer than the flowers or fruit* (1′–3′).

E. lóngipes, Gray. Goumi. (E. Édulis of nurseries.) Diffuse tall bush with oval thin leaves, green above and silvery-shining below, and single axillary flowers followed by hanging, oblong, rusty-punctate drupes. Japan. Cult. for the edible fruit.

* * *Pedicels little, if at all, exceeding the flowers.*

E. argéntea, Pursh. Silver Berry. Wild from Minn., W., and sometimes cult.; 6°–12° high, stoloniferous, the young branches bearing rusty scales; leaves elliptic or lanceolate and undulate, silvery-scurfy and rusty; flowers numerous and fragrant, followed by round-ovoid and mealy edible fruit.

E. hortènsis, Bieb. Oleaster. Tall shrub or small tree, often spiny, cult. from the Old World for the whiteness of its cottony shoots and under surfaces of the narrow-lanceolate or lance-ovate, mostly obtuse leaves; flowers small and yellowish inside, but silvery without, fragrant, followed by small red fruits. The Russian Olive, somewhat planted in the West, is var. ***Songórica***, Bernh.

2. SHEPHÉRDIA. (*John Shepherd* was once curator of the Liverpool Botanic Garden.)

S. Canadénsis, Nutt. A low shrub along our northern borders, with oval leaves, soon green above, but silvery and with some rusty scurf beneath, 4-parted flowers, and yellowish berries.

S. argéntea, Nutt. Buffalo Berry. Shrub through the plains and mountains far W. and N. W., and planted for ornament and fruit, has oblong leaves with narrowed base, silvery both sides, and edible acid red berries.

CII. LORANTHACEÆ, MISTLETOE FAMILY.

Shrub-like small plants with hard greenish foliage, closely allied to the next family and differing chiefly in the more reduced flowers and the habit. Parasitic on the branches of trees; represented in this country chiefly by

Phoradéndron flavéscens, Nutt. American or False Mistletoe. With obovate or oval, yellowish-green, thick, slightly petioled leaves, and short, yellowish, jointed spikes in their axils, of dicœcious greenish flowers, the fertile ones ripening white berries. On deciduous trees, N. J., W. and S.

CIII. SANTALACEÆ, SANDALWOOD FAMILY.

Herbs, shrubs, or trees, with entire leaves and a 4–5-cleft calyx valvate in the bud and its tube joined to the 1-celled ovary, which contains 2–4 ovules hanging from the top of a stalk-like central placenta, but the fruit always 1-seeded and indehiscent. Style 1. Stamens as many as the lobes of the calyx and opposite them.

1. COMANDRA. Flowers perfect, in umbel-form clusters. Calyx bell-shaped or urn-shaped, provided with a 5-lobed disk above the ovary. Fruit drupe-like or nut-like, bearing the persistent calyx lobes on its top. Low perennials, often parasitic on roots of other plants.
2. PYRULARIA. Flowers generally imperfect, in spikes or racemes. Calyx 4–5-cleft, the divisions recurved, and, in the sterile flowers, with a hairy tuft at the base. Fertile flowers with a pear-shaped ovary, which becomes a fleshy, drupe-like fruit. Shrubs or trees.

1. COMÁNDRA, BASTARD TOAD FLAX. (Greek: *hair* and *stamens*.)

C. umbellàta, Nutt. Dry ground, common N.; parasitic on the roots of shrubs and trees. Known by the 5 stamens with their anthers connected with the face of the white calyx lobes, behind them by a tuft of thread-like hairs (to which the name alludes). Stems 6′–10′ high, with many small, oblong, pale, alternate, and almost sessile entire leaves. Has much the aspect of Hypericum.

C. lívida, Rich. Grows on L. Superior, and has larger leaves, 3–5-flowered axillary peduncles, short calyx tube with ovate lobes, short style, and pulpy red berry.

2. PYRULÀRIA. (From *Pyrus*, from the shape of the fruit.)

P. pùbera, Michx. Oil Nut, Buffalo Nut. Shrub 3°–12° high, growing in rich woods in the mountains of Penn. and S.; shoots minutely downy when young, but becoming glabrous; leaves obovate-oblong, mostly acute, soft and very veiny and minutely punctate; fruit an inch long.

CIV. EUPHORBIACEÆ, SPURGE FAMILY.

Plants with mostly milky acrid juice and monœcious or dicœcious flowers, of very various structure; the ovary and fruit commonly 3-celled and with single or at most a pair of hanging ovules and seeds in each cell. A large family in warm countries, always difficult for the beginner. The peculiar characters of the flowers are more fully specified in the following synopsis.

* *Ovules and seeds only one in each cell.*

\+ *Flowers, both staminate and pistillate, really destitute both of calyx and corolla; a pistillate and numerous staminate ones surrounded by a cup-like involucre which imitates a calyx, so that the whole may be taken for one perfect flower.*

1. EUPHORBIA. These plants may be known, mostly, by having the 3-lobed ovary raised out of the cup, on a curved stalk, its 3 short styles each 2-cleft, making 6 stigmas. Fruit when ripe bursting into the 3 carpels, and each splitting into 2 valves, discharging the seed. What seems to be a stamen with a jointed filament is really a staminate flower, in the axil of a slender bract, consisting of a single stamen on a pedicel, the joint being the junction.

\+ \+ *Flowers of both kinds provided with a distinct calyx.*

++ *Stamens* 5 *or more.*

= *Flowers in cymose* (2–3-*forked*) *panicles; stamens* 10 *or more.*

2. JATROPHA. Fertile flowers in the main forks of the panicle. Calyx colored like a corolla, in the sterile flowers mostly salver-shaped and 5-lobed, enclosing 10–30 stamens, somewhat monadelphous in two or more ranks; in the fertile 5-parted. Styles 3, united below, once or twice forked at the apex. Pod 3-celled, 3-seeded. Leaves alternate, long-petioled, with stipules.

= = *Flowers in terminal racemes or spikes.*

‖ *Leaves scarcely or not at all lobed, often entire.*

○ *Ovary and fruit* 1-*celled.*

3. CROTONOPSIS. Flowers monœcious, in very small terminal or lateral spikes or clusters, the lower ones fertile. Sterile flowers with an equally 5-parted calyx, 5 spatulate petals, and 5 stamens opposite the petals. Fertile flowers with unequally 3–5-parted calyx, 0 petals, but 5 petal-like scales opposite the divisions of the calyx.

○ ○ *Ovary* 2–4 (*commonly* 3-) *celled, or rarely* 1-*celled in No.* 6.

4. CROTON. Flowers monœcious or dicœcious, generally in racemes or spikes. Sterile flowers with a normally 5-parted calyx, as many petals or rudiments as there are calyx lobes and alternating with lobes of the disk, the stamens 5 or more. Fertile flowers with a 5–10-cleft or parted calyx, the petals 0 or very small rudiments.

5. CODIÆUM. Flowers monœcious. Sterile flowers with a membranaceous 3–6-parted calyx, the divisions imbricated and becoming reflexed, five short scale-like petals alternating with as many glands, and many or numerous stamens. Fertile flowers with a 5-cleft calyx but no petals, the ovary surrounded by 5 scales.

6. ACALYPHA. Flowers in small clusters disposed in spikes, staminate above, fertile at base; or sometimes the two sorts in separate spikes. Calyx of sterile flowers, 4-parted, of fertile 3–5-parted. Stamens 8–16, short, monadelphous at base; the 2 cells of the anther long and hanging. Styles 3, cut-fringed on the upper face, red. Pod of 3 (rarely 2 or 1) lobes or cells. Fertile flower clusters embraced by a leaf-like cut-lobed bract. Leaves alternate, petioled, with stipules, serrate.

‖ ‖ *Leaves prominently digitate-lobed.*

7. RICINUS. Flowers in large paniced clusters, the fertile above, the staminate below. Calyx 5-parted. Stamens very many, in several bundles. Styles 3, united at base, each 2-parted, red. Pod large, 3-lobed, with 3 large seeds. (Lessons, Fig. 419.) Leaves alternate, with stipules.

++ ++ *Stamens* 2 *or* 3.

8. TRAGIA. Flowers monœcious and apetalous, in racemes. Sterile flowers with 3–5-cleft calyx. Fertile flowers with 3–8-parted persistent calyx. Calyx lobes valvate in the bud. Plants pubescent or hairy.

9. STILLINGIA. Flowers in a terminal spike, naked and staminate above, a few fertile flowers at base. Calyx 2–3-cleft. Stamens 2, rarely 3. Pod 3-lobed. Stigmas 3, simple. Bracts with a fleshy gland on each side. Leaves alternate, stipulate. Plants glabrous.

* * *Ovules and mostly seeds* 2 *in each cell of the ovary and* 3*-horned pod. Juice not milky in the following, which have monœcious flowers, mostly* 4 *sepals,* 4 *exserted stamens in the sterile, and* 3 *awl-shaped spreading or recurved styles or stigmas in the fertile, flowers.*

10. BUXUS. Flowers in small sessile bracted clusters in the axils of the thick and evergreen entire opposite leaves. Shrubs or trees.

11. PACHYSANDRA. Flowers in naked lateral spikes, staminate above, a few fertile flowers at base. Filaments long, thickish and flat, white. Nearly herbaceous, low, tufted; leaves barely evergreen, alternate, coarsely few-toothed.

12. PHYLLANTHUS. Flowers axillary and monœcious. Calyx commonly 5–6-parted, imbricated in the bud. Petals 0. Stamens generally 3. Ovules 2 in each cell. Leaves alternate in 2 ranks.

1. EUPHÓRBIA, SPURGE. (Said to be named for *Euphorbus*, physician to King Juba.) Flowers commonly in late summer. Only the commonest species mentioned here.

* *Shrubby species of the conservatory, winter-flowering, with red bracts or leaves.*

E. pulchérrima, Willd., or POINSETTIA, of Mexico; unarmed stout shrub, with ovate or oblong and angled or sinuately few-lobed leaves, rather downy beneath, those next the flowers mostly entire (4′–5′ long) and of the brightest vermilion-red; flowers in globular greenish involucres bearing a great yellow gland at the top on one side.

E. splèndens, Bojer. CROWN OF THORNS. Mauritius; smooth with thick and horridly prickly stems, oblong-spatulate, mucronate leaves, and slender, clammy peduncles, bearing a cyme of several deep-red apparently 2-petalous flowers; but the seeming petals are bracts around the cup-like involucre of the real flowers.

E. fúlgens, Karw. (E. JACQUINIÆFLÒRA). Mexico; unarmed, smooth, with slender recurved branches and broadly lanceolate leaves, few-flowered; peduncles shorter than the petioles; what appears like a 5-cleft corolla are the bright red lobes of the involucre.

* * *Herbs natives of or naturalized in the country, the last and sometimes a few of the others cult. in gardens; flowers late summer.*

– *Glands of the involucre with more or less conspicuous petal-like margins or appendages, these usually white or rose-colored (obscure in the first).*

– – *Leaves all opposite, small and short-stalked, oblique at the base.* ①

= *Seeds not roughened; leaves entire, and the entire plant glabrous.*

E. polygonifòlia, Linn. A prostrate, spreading, reddish little plant growing on the sands of the seacoast and along the Great Lakes; leaves

oblong-linear, obtuse and mucronate; lobes of the involucre longer than the minute and unappendaged glands.

= = *Seeds minutely roughened or wrinkled; leaves serrulate, and the plant often hairy.*

E. glyptospérma, Engelm. Glabrous or rarely slightly puberulent, erect or spreading; leaves linear-oblong and mostly falcate, very unequal at the base, serrulate near the obtuse apex; stipules lanceolate and cut; seeds sharply 4-angled, marked with 5 or 6 sharp transverse wrinkles. Ontario, W.

E. maculàta, Linn. Prostrate; leaves oblong-linear, very oblique at base, serrulate above, blotched in the center; pods sharp-angled, very small, with 4 shallow grooves. Common along roads and in dry fields.

E. humistràta, Engelm. Procumbent, hairy, or puberulent; leaves elliptic or obovate, very oblique at the base, sparsely hairy underneath, sometimes with a brown spot on the upper side; involucre cleft on the back, the truncate or crenate appendages red or white; seeds ovate, obtusely angled and minutely roughened. Rich places, Ind., W.

E. Préslii, Guss. Ascending 10′–20′ high; leaves ovate-oblong or linear-oblong, serrate, often with red spot or margins; appendages entire; pod blunt-angled; seeds ovate, obtusely angled, wrinkled and tubercled, blackish. Common.

+ + *Leaves opposite or whorled at the top of the stem, alternate or scattered below, larger; plants strict.*

E. marginàta, Pursh. Snow on the Mountain. Wild on the plains W. of the Mississippi, and cult. for ornament; leaves pale, ovate or oval, sessile, the lower alternate, uppermost in threes or pairs and broadly white-margined; flower-cup with 5 white petal-like appendages behind as many saucer-shaped glands. Stout, 2°–3° high. ①

E. corollàta, Linn. Gravelly or sandy soil, from N. Y., S. and W.; 2°–3° high; leaves varying from ovate to linear, entire, the lower alternate, upper whorled and opposite; flower cups umbelled, long-stalked, with 5 bright white conspicuous appendages, imitating a 5-cleft corolla. 2

+ + *Glands of the involucre destitute of petal-like appendages.*

+ *Involucres (or "flowers") in terminal clusters, with few or solitary glands; all, or the uppermost, leaves opposite, variable; stipules small and glandular.* ①

E. dentàta, Michx. Rich soil from Penn. S. and W.; hairy, only the lower leaves alternate, the upper opposite, varying from ovate to linear, uppermost paler or whitish at base, and the few glands of the flower cup short-stalked.

E. heterophýlla, Linn. Glabrous; leaves alternate, ovate and sinuate-toothed, or fiddle-shaped, or some of them lanceolate or linear and entire; the upper with red base; no petal-like appendages to the flower cup and only 1 or 2 sessile glands. Minn., S.

+ + *Involucres in a terminal forked or umbel-like inflorescence, with 4 or 5 entire or crescent-shaped glands; plants ascending or erect, generally glabrous; stipules 0.*

= *Leaves of the commonly erect stem alternate or scattered; those of the umbel-like inflorescence whorled or opposite and of different shape, usually roundish; glands of the flower cup mostly 4. Weeds or weed-like.*

‖ *Glands of the flower cup or involucre transversely oval and obtuse.* ①

E. platyphýlla, Linn. Nat. from Eu. N.; upper stem-leaves lance-oblong-acute, minutely serrulate; uppermost heart-shaped; floral ones triangu-

lar-ovate and heart-shaped; umbel 5-rayed; glands large and sessile; pod beset with depressed warts; seed smooth.

E. obtusàta, Pursh. Like the preceding, but taller, 1°–2° high; stem leaves oblong-spatulate and obtuse, the upper heart-shaped; floral ones dilated-ovate; umbel once or twice 3-rayed, then 2-rayed; glands of flower cup short-stalked; pods long-warty. Va., W. and S.

E. dictyospérma, Fisch. & Meyer. Resembles the preceding, but slender; leaves obtusely serrate; glands small, almost sessile; seeds delicately reticulated. Md. to Minn., and S.

E. Helioscòpia, Linn. Weed from Eu., in waste places N.; with stouter ascending stems 6′–12′ high; leaves all obovate and rounded or notched at the end, the lower wedge-shaped, finely serrate; umbel first with 5, then 3, and at length with 2 rays; glands orbicular and stalked; pods smooth and even; seeds with honeycomb-like surface.

‖ ‖ *Glands of the flower cup with 2 long horns; pod smooth; seeds sculptured or pitted and pale.* ① ②

E. Péplus, Linn. Waste places from Eu.; stem erect; leaves petioled, entire, round-obovate, the upper floral ones ovate; umbel first 3-rayed, afterwards 2-forked; pod 2-crested on each lobe.

E. commutàta, Engelm. Wild from Minn. and Md., S. W., on shady slopes; stems with decumbent base; leaves obovate, the upper sessile, the rounded floral ones broader than long; umbel 3-forked; pod crestless; flowers early summer.

‖ ‖ ‖ *Glands crescent-shaped; pod granular; seeds smooth, dark-colored.* ♃

E. Cyparíssias, Linn. Cypress Spurge. Gardens from Eu. and running wild E.; in dense clusters 6′–10′ high, smooth; stem and branches crowded with small linear entire leaves, the floral ones small and rounded heart-shaped; umbel many-rayed.

= = *Leaves all or chiefly opposite, entire, smooth, almost sessile; pod smooth.*

E. Ipecacuánhæ, Linn. Ipecac Spurge. Sandy soil from Conn., S. and W.; branching repeatedly from the long perpendicular root, widely spreading; leaves barely 1′ long, varying from obovate to linear; peduncles solitary in the forks, slender; flower-cup dull-purple, with 5 glands. ♃

E. Láthyris, Linn. Caper Spurge, Mole Plant. Cult. from Eu., in country gardens; glaucous; stem erect, stout, 2°–3° high; leaves thick; those of the stem lance-linear, floral ones oblong-ovate and heart-shaped; umbel 4-rayed, then forking; glands short-horned. ②

2. JÁTROPHA. (Name not applicable.) Chiefly tropical plants; one is a weedy wild plant, viz.

J. stimulòsa, Michx. Tread-softly or Spurge Nettle, names referring to its stinging bristly hairs, which are like those of Nettles; dry sandy soil, branching, 6′–12′ high; leaves rounded heart-shaped, 3–5-lobed or variously cleft or parted; flowers slender, white; stamens 10, their filaments almost separate. Sandy soil, Va., S. ♃

3. CROTONÓPSIS. (*Croton-like.*) ①

C. linearis, Michx. A low, slender plant with alternate or opposite linear or lanceolate leaves, green above and silvery-hoary and scurfy beneath, as are the branches. Sandy soil, N. J., W. and S.

4. CRÒTON. (Greek name of the Castor-oil plant.) ①

C. glandulòsus, Linn. Rough-hairy and glandular, umbellately branched; leaves oblong or linear-oblong and obtusely toothed; sterile flowers with 4-parted calyx, 4 petals and 4 rays on the disk, and 8 stamens; fertile flowers clustered at the base of the sterile spike, with 5-parted calyx, very minute rudiments of petals, and three 2-cleft styles; 1°–2°. Va., W. and S.

C. capitàtus, Michx. Densely soft-woolly and somewhat glandular, 1°–2°; leaves lance-oblong or long-oblong, rounded at the base, entire, on long stalks; sterile flowers with 5-parted calyx, 5 petals and 5 glands alternating, and 10–14 stamens; fertile flowers capitate at the base of the short sterile spike, with 7–12-parted calyx, 0 petals, and 3 styles twice or thrice 2-parted. Barrens, N. J., S. and W.

C. monanthógynus, Michx. Plant a foot or two high, rusty-glandular and whitish-stellate-pubescent; leaves narrow-oblong to ovate-oblong, entire; sterile flowers few on the summits of short and erect peduncles, with 3–5-parted calyx and as many petals and glands, and 3–8-stamens; fertile flowers solitary or few on short recurved peduncles, with 5-parted calyx, 0 petals, 5 glands, and 2 sessile, 2-parted stigmas. Barren lands, Ind., S. and W.

5. CODIÆUM. (Name constructed from the Malayan name of one species.) Plants growing in the Oriental tropics and known in greenhouses as CROTONS. The cultivated forms are very numerous, being distinguished by the handsome markings of the foliage. The commonest species represented in these forms is ***C. variegàtum***, Blume (C. PICTUM of horticultural literature).

6. ACALÝPHA. (Ancient Greek name of *Nettle*.) Several species are cult. in choice greenhouses for ornamental foliage. Flowering through late summer and autumn.

A. Virgínica, Linn. A common, coarse, low weed in fields, etc.; smoothish or hairy, turning purplish, with leaves varying from ovate to ovate-oblong, serrate; fertile flowers in short clusters; pod and seed smoothish. There is a variety with linear leaves. ①

A. Caroliniàna, Ell. Has thin heart-shaped, closely serrate leaves, mostly a long terminal fertile spike, pods beset with soft prickles, and seeds rough-wrinkled. N. J., W. and S. ①

7. RÍCINUS, PALMA CHRISTI, CASTOR-OIL PLANT. (Latin name of a bug, which the seed resembles.)

R. commùnis, Linn. A sort of tree, but cult. in temperate climates as a stately annual, for its seeds, from which *castor-oil* is expressed, and in ornamental grounds for its magnificent foliage; the peltate and palmately 7–11-cleft leaves 1°–2° broad, or even more; flowers late summer. There is only one species, although some of the most distinct forms have been given specific names. Probably African.

8. TRÀGIA. (Named for *Bock*, an early herbalist, whose Latin name was *Tragus*.) Ours ♃

* *Plant not truly twining; leaves short-stalked.*

T. innócua, Walt. Erect and branched, soft-hairy and not stinging, 6′–12′; leaves obovate-oblong to narrow-linear, acute at the base; stamens 2. Sandy soil, Va., S.

T. nepetæfòlia, Cav. Erect or very slightly twining, bearing stinging hairs; leaves ovate- or triangular-lanceolate, cordate or truncate at the base; stamens 3–5. Va., S.

* * *Plant twining; leaves (except the uppermost) long-stalked.*

T. macrocárpa, Willd. Leaves ovate and acuminate, deeply cordate, serrate. Ky., S.

9. STILLÍNGIA. (Named for *Dr. B. Stillingfleet.*) Very smooth plants, only S.; flowering all summer.

* *Herb; leaves serrulate.*

S. sylvática, Linn. QUEEN'S DELIGHT. Dry soil, Va., S. and W.; 1°–3° high, clustered from a woody root; leaves crowded, almost sessile, varying from obovate to lance-linear, serrulate; stamens 2.

* * *Shrubby; leaves entire.*

S. ligustrìna, Michx. River swamps from N. Car., S.; 6°–12° high; leaves lance-obovate or oblong; spikes short; stamens mostly 3.

S. sebífera, Michx. TALLOW TREE of China, planted S. Car. and S.; tree 20°–40° high; leaves rhombic-ovate, long-petioled; stamens 2; seeds white, yielding a useful vegetable tallow or wax.

10. BÚXUS, BOX. (Ancient Latin, from the Greek name of the Box Tree.)

B. sempérvirens, Linn. TREE BOX, and its more common var. NÀNA, the DWARF BOX, with much smaller leaves, from the Mediterranean, are planted N., chiefly for borders, especially the Dwarf Box.

11. PACHYSÁNDRA. (Greek: *thick stamens.*) 2

P. procúmbens, Michx. Rocky woods, W. slope of the Alleghanies, from Ky., S., and in some gardens; developing its copious spikes from the base of the short procumbent densely tufted stems, in early spring.

12. PHYLLÁNTHUS. (Greek: *leaf, blossom:* the flowers in some species being borne on dilated, leaf-like branches.)

P. Carolinénsis, Walt. A low and slender plant, growing in gravelly soils from Penn., S. and W.; leaves short-stalked, obovate or oval; flowers generally 2 in each axil, 1 staminate, 1 fertile, both almost sessile. ①

CV. URTICACEÆ, NETTLE FAMILY.

This family, taken in the largest sense, includes very various apetalous plants, with monœcious or dicœcious flowers (except in the Elm Subfamily), having a distinct calyx free from the 1-seeded (but sometimes 2-celled) fruit. Stamens as many as the lobes of the calyx and opposite them, or sometimes fewer. Inner bark generally tough. Leaves with stipules, which are sometimes early deciduous.

I. ELM SUBFAMILY. Trees, the juice not milky. Leaves alternate, 2-ranked, simple; stipules small and falling early.

Flowers monœciously polygamous, or perfect, with the filaments not inflexed in the bud, and 2 diverging styles or long stigmas. Ovary 1–2-celled, with 1 or 2 hanging ovules, in fruit always 1-celled and 1-seeded.

* *Fruit dry, winged or nut-like. Anthers turned outwards.*

1. ULMUS. Calyx bell-shaped, 4–9-cleft. Stamens 4–9; filaments long and slender. Ovary mostly 2-celled, becoming a 1-celled thin samara or key-fruit winged all round (Lessons, Fig. 390). Flowers in clusters in axils of last year's leaves, in early spring, before the leaves of the season, purplish or yellowish-green. Leaves straight-veined, serrate.
2. PLANERA. Like Elm, but flowers more polygamous, appearing with the leaves in small axillary clusters; the lobes of the calyx and stamens only 4 or 5; the 1-celled 1-ovuled ovary forming a wingless nut-like fruit.

* * *Fruit a berry-like globular small drupe. Anthers turned inward.*

3. CELTIS. Calyx 5–6-parted, persistent. Stamens 5 or 6. Stigmas very long, tapering. Ovary and drupe 1-celled, 1-seeded. Flowers greenish, in the axils of the leaves; the lower ones mostly staminate and clustered, the upper fertile and mostly solitary on a slender peduncle.

II. HEMP SUBFAMILY. Rough herbs, with watery juice and tough fibrous bark. Leaves mostly opposite and palmately lobed or compound. Flowers dicœcious, greenish; the sterile in axillary loose compound racemes or panicles, the fertile in close clusters or catkins; calyx of the former with 5 sepals, of the latter 1 scale-like sepal embracing the ovary and akene. Stigmas or hairy styles 2, long.

4. CANNABIS. Erect herb. Stamens 5, drooping. Fertile flowers in irregular spiked clusters. Leaves of 5–7 lanceolate irregularly toothed leaflets.
5. HUMULUS. Tall-twining. Stamens erect. Fertile flowers in solitary short catkins or spikes, 2 flowers under each of the broad thin bracts which make the scales of the strobile or hop fruit.

III. FIG SUBFAMILY. Woody plants, generally trees, with milky or colored acrid or poisonous juice. Leaves alternate. Flowers strictly monœcious or dicœcious. Styles or stigmas commonly 2.

* *Flowers of both kinds mixed, lining the inside of a closed fleshy receptacle, or hollow flower stalk, which ripens into what seems to be a sort of berry.*

6. FICUS. Receptacle in which the flowers are concealed borne in the axil of the leaves. Akene seed-like. Stipules large, successively enveloping the young leaves in the bud, falling off as the leaves expand. (Lessons, Figs. 405, 406, 407.)

* * *Flowers of the two kinds mostly separate; the fertile crowded in catkin-like spikes or heads, which become fleshy in fruit; filaments inflexed in the bud, spreading elastically when the calyx expands.*

7. MACLURA. Flowers dicœcious; the sterile in racemes, and nearly like those of Mulberry; the fertile densely crowded in a large spherical head, its calyx of 4 unequal sepals, in fruit inclosing the small akene; the whole head ripening into a fleshy yellow mass, resembling an orange with a roughish surface.

8. MORUS. Flowers usually monœcious, both sorts in catkin-like spikes. Calyx 4-parted. Stamens 4. Fertile spike altogether becoming an oval or oblong multiple pulpy fruit imitating a blackberry, but the pulp consists of the calyx, bracts, etc., of the flowers, each inclosing a small akene. (Lessons, Figs. 408, 409, 410.)
9. BROUSSONETIA. Flowers dicœcious; the sterile in cylindrical catkins, and like those of Mulberry; the fertile in globular heads, mixed with little bristly scales, their calyx urn-shaped and 3–4-toothed, out of which the ripened ovary protrudes and forms a club-shaped rather fleshy fruit. Style single.

IV. NETTLE SUBFAMILY, PROPER. Herbs, as to our wild species, with bland watery juice and tough fibrous bark; many are armed with stinging hairs. Flowers monœcious or dicœcious, greenish. Filaments transversely wrinkled and inflexed in the bud, straightening elastically when the calyx opens. Fruit an akene; style or stigma one and simple.

* *Plant bearing stinging bristles or hairs.*

10. URTICA. Flowers in racemed, spiked, or head-like clusters; the calyx in both sorts of 4 separate sepals. Stamens 4. Stigma a sessile globular tuft. Akene flat, ovate, straight and erect, inclosed between the larger pair of sepals. Leaves opposite.
11. LAPORTEA. Flowers in loose open cymes, the upper chiefly fertile, and lower sterile; the latter with 5 sepals and stamens; the former of 4 very unequal sepals, the two outer or one of them minute. Stigma slender awl-shaped, hairy down one side, persistent on the ovate flat very oblique and nearly naked akene, which is soon reflexed on its wing-margined pedicel. Leaves large, alternate.

* * *Plant not stinging.*

12. BŒHMERIA. Flowers either dicœcious or intermixed, clustered in spikes, not involucrate; the sterile as in Urtica; the fertile with a tubular or urn-shaped calyx barely toothed at the apex, inclosing the ovary and closely investing the oblong flat akene. Style long and slender, the stigma on one side. Leaves opposite and serrate.
13. PARIETARIA. Flowers monœciously polygamous, the different kinds intermixed in involucrate-bracted cymose axillary clusters. Sterile flowers like Bœhmeria. Fertile flowers with a tubular or bell-form 4-lobed and nerved calyx inclosing the akenes. Style slender or none, the stigma tufted. Leaves alternate, entire.

1. ÚLMUS, ELM. (The classical Latin name.) Fine trees in deep, mostly moist or alluvial soil. Flowers early spring; fruit in early summer.

* *Leaves rough and harsh on the upper, soft and usually downy on the lower surface; seed in the middle of the orbicular or round-oval fruit, far away from the shallow notch; flower-clusters globular; pedicels very short.*

U. fúlva, Michx. SLIPPERY ELM. Rather small tree, with tough reddish wood, well-known very mucilaginous inner bark, and rusty-downy buds; leaves 4′–8′ long, doubly serrate, very rough above; these and the flowers sweet-scented in drying; calyx lobes and stamens 7–9; fruit much less than 1′ long, the seed-bearing center pubescent. N. Eng., W. and S.

U. montàna, Withering. WYCH-ELM or SCOTCH ELM. Commonly planted, from Eu.; leaves smaller and less rough; buds not downy; calyx lobes and stamens about 5; fruits 1′ long, smooth.

* * *Leaves smooth above, smaller; notch at the summit of the fruit reaching nearly to the seed-bearing cell; fruit only about ½′ long.*

† *Flowers in close clusters; pedicels very short or hardly any; stamens 4 or 5; fruit smooth, round-obovate.*

U. campéstris, Linn. ENGLISH ELM. Large tree from Eu., with rather short horizontal or ascending branches; leaves 2′–4′ long, mostly or soon

smooth. Immensely variable under cultivation, and known under many names. The Cork Elm, U. suberòsa, is a form of this species with thick plates of cork on the branches.

+ + *Flowers soon hanging on slender stalks, which are jointed above the middle; fruit ovate or oval, with 2 sharp teeth at apex, the margin downy-ciliate, at least when young.*

U. Americàna, Linn. American or White Elm. Well known large tree, with long ascending branches gradually spreading, drooping slender branchlets, which are smooth as well as the buds, not corky; the abruptly pointed leaves 2′–4′ long; flowers in close clusters, with usually 7–9 calyx lobes and stamens; fruit smooth except the margins, its incurved points closing the notch. The tree is very variable in habit of growth. Forms of it are known as Rock Elm and Water Elm. (Lessons, Fig. 80.)

U. racemòsa, Thomas. Corky White Elm, Rock Elm of some eastern communities. Resembles the foregoing, but with downy-ciliate bud scales; branches becoming corky, young branchlets somewhat pubescent, leaves with straighter veins, and flowers racemed. Vt., S. and W.

U. alàta, Michx. Whahoo or Winged Elm. Va. to Mo. and S.; small tree, with bud scales and branchlets nearly smooth, winged plates of cork on the branches, and small thickish leaves (1′–2′ long) almost sessile.

2. PLÁNERA, PLANER TREE. (*J. J. Planer*, a German botanist.) Flowers greenish, appearing with the leaves in early spring.

P. aquática, Gmel. American P. River swamps, from Ky., S. and W.; small tree; leaves ovate-oblong, smooth; fruit stalked in the calyx, beset with irregular warts or crests.

3. CÉLTIS, HACKBERRY or NETTLE TREE. (Ancient Greek name for the *Lotus berry*.) Flowers spring; fruit ripe in autumn, eatable.

C. occidentàlis, Linn. American H. Small or middle-sized tree, of rich low grounds; with reticulated, ovate and taper-pointed, serrate or entire leaves, oblique or partly heart-shaped at base, sweet thin-fleshed fruit as large as a pea. Var. **pùmila**, a straggling bush, chiefly S., only 4°–10° high.

4. CÁNNABIS, HEMP. (The ancient Greek name.) Flowers all summer. ①

C. satìva, Linn. Common Hemp. Tall coarse plant from the Old World; cult. for the fibers of its stem, and spontaneous in moist yards.

5. HÙMULUS, HOP. (Name obscure.) Flowers summer. ♃

H. Lùpulus, Linn. Common Hop. Wild in alluvial soil N. Eng., W., and also cult. from Eu. for hops; the aromatic bitterness resides in the yellow resinous grains which appear on the fruiting calyx, akenes, etc.; stems almost prickly downwards; leaves heart-shaped and strongly 3–7-lobed.

6. FÌCUS, FIG. (The Latin, altered from the Greek name of the Fig.)

F. Cárica, Linn. Common Fig. Cult. from the Levant. as a house-plant N.; leaves broad, 3–5-lobed, roughish above, rather downy beneath; figs single in the axils, pear-shaped, luscious. (Lessons, Figs. 405–407.)

F. elástica, Roxb. India-Rubber Tree of E. Indies (not that of S. Amer.); tree cult. in conservatories for its beautiful leaves, 6′–10′ long, oval-oblong, entire, thick, smooth, bright green, glossy above.

F. púmila, Linn. (F. rèpens and F. stipulàta). China; a delicate creeping species, fixing itself firmly by rootlets and covering walls in conservatories; leaves 1′ or less long, oblong-ovate, with unequal partly heart-shaped base.

7. **MACLÙRA**, OSAGE ORANGE. (Named for the late *Mr. Maclure*, founder of the Academy of Natural Sciences, Philadelphia.)

M. aurantìaca, Nutt. Common O., or Bois d'arc (Bow Wood, the tough yellow wood used for bows by the Indians). Low bushy tree from Kan. and Mo., S.; multiplying rapidly by its running roots; planted for hedges, especially W.; armed with slender and very sharp spines; leaves lance-ovate, entire, very glossy; flowers spring.

8. **MÒRUS**, MULBERRY. (Old Greek and Latin name.) Trees. Leaves heart-shaped or ovate, mostly serrate, often palmately lobed; short catkin-like spikes axillary or lateral; flowers spring; fruit in summer, eatable. (Lessons, Figs. 408–410.)

* *Leaves bright and glabrous, and mostly glossy above.*

M. álba, Linn. White Mulberry. Leaves light green, rather small, smooth or very nearly so above and often shining, the veins prominent beneath and whitish, variously lobed or divided, the basal lobes unequal, the teeth large and for the most part rounded or nearly obtuse, the branches gray or grayish-yellow. Fruits small in the half wild form, which is common along fences in the E. States, whitish or purple, but in the cultivated varieties, as New American, an inch or two long and purple-black. The commonest mulberry of the N. From China. The Russian Mulberry is a form of it (var. *Tatárica*, Loudon).

* * *Leaves dull green, mostly more or less rough.*

M. latifòlia, Poiret. (M. multicaùlis). Multicaulis Mulberry. A strong-growing small tree or giant shrub, with dull, roughish, and very large long-pointed leaves, which are seldom or never prominently lobed, and which are often convex above, bearing black sweet fruit. Original of the Downing Mulberry, although the New American (M. alba) often passes for that variety; also used for stocks upon which to graft other sorts. Not fully hardy in the Northern States. Once much recommended here for the silkworm. China.

M. nìgra, Linn. Black Mulberry. Leaves dark dull green, rather large, tapering into a prominent point, commonly very rough above, usually not lobed, the base equal or very nearly so upon both sides, the teeth rather small and close, the branches brown; fruit large and sweet, black or very dark-colored. Native of Asia, probably of Persia and adjacent regions. Cult. in the Old World for its fruit, but in America it is very little grown. It is not hardy, except in protected places, in N. Eng. and N. Y.

M. rùbra, Linn. Red Mulberry. Leaves usually large, very various, those on the young shoots deeply lobed, with very oblique and rounded sinuses in the base of which there are no teeth, the upper surface rough and the lower one soft or variously pubescent, the teeth medium or comparatively small and either rounded or bluntish. Generally distributed from western N. Eng. to Neb., and southward to the Gulf, being much more abundant and attaining a larger size in the south. The fruit is deep red, or when fully ripe, almost black, variable in size, often very good, nearly always having an agreeable slight acidity. Also cult. as Hicks, Stubbs, etc.

9. BROUSSONÈTIA, PAPER MULBERRY. (Named for *P. N. V. Broussonet*, a French herbalist.)

B. papyrífera, Vent. Cult. as a shade tree from N. Y., S.; spreading by suckers, with a very fibrous bark; leaves rough above, downy beneath, serrate, some of them ovate or slightly heart-shaped, others 3-cleft or variously lobed; flowering in spring. Japan and adjacent regions.

10. URTÌCA, NETTLE. (The classical Latin name.) Common in waste grounds and near dwellings; flowers summer.

* *Flower clusters in branching panicled spikes; often diœcious.* 2

U. grácilis, Ait. Fence rows, etc., common; 2°–6° high, with ovate-lanceolate, serrate leaves, long petioles, rather few stings, and slender spikes.

U. dioìca, Linn. A weed from Eu., full of stings, 2°–3° high, with heart-ovate more deeply serrate leaves, downy beneath and shorter petioles.

* * *Flower clusters shorter than the petiole, mostly 2 in the same axil, containing both sorts of flowers; stings scattered.* ①

U. ùrens, Linn. Weed from Eu., not common; 8′–12′ high, with ovate leaves deeply cut into long spreading teeth; flower clusters small, loose; stings few.

U. chamædryoìdes, Pursh. Slender, with heart-ovate or lance-ovate leaves moderately toothed, and dense flower clusters; stings sparse. Ky., S.

11. LAPÓRTEA, WOOD NETTLE. (Named for *M. Laporte.*) 2

L. Canadénsis, Gaud. Moist and rich woods; 2°–3° high; ovate leaves 4′–7′ long and long-petioled, a single 2-cleft stipule in the axil; flowers all summer.

12. BŒHMÈRIA, FALSE NETTLE. (Named for *Prof. G. R. Böhmer* of Germany.) 2

B. cylíndrica, Willd. Moist shady grounds, 1°–3° high, smoothish; leaves mostly opposite, ovate or lance-ovate, 3-nerved, serrate, long-petioled; flower-clusters crowded in long narrow interrupted spikes, in summer.

B. nívea, Gaud. RAMIE, or the GRASS-CLOTH PLANT of China; 3°–4° high, with ovate leaves white-downy beneath; planted S. for its valuable textile fibers.

13. PARIETÀRIA, PELLITORY. (Latin, from its habit of growing on walls.) ①

P. Pennsylvánica, Muhl. Low, only sparingly branched, or simple, minutely downy; leaves thin and veiny, roughish with opaque dots, oblong-lanceolate. Shady places, Mass., W. and S.

CVI. PLATANACEÆ, PLANE TREE FAMILY.

This small order consists merely of the genus

1. PLÁTANUS, PLANE TREE. (The ancient name of the Oriental species, from the Greek word for *broad*, alluding either to the leaves or the wide-spreading branches.) Flowers monœcious, in separate naked heads hanging on slender peduncles; the sterile of many short stamens with club-shaped little scales intermixed; the fertile of club-

shaped or inversely pyramidal ovaries mixed with little scales and tipped with a slender awl-shaped simple style, ripening into a sort of akene with a tawny-hairy contracted base. No evident calyx. Leaves alternate, palmately lobed or angled, the hollowed base of the petiole covering and concealing the axillary bud (Lessons, Fig. 74); stipules sheathing, like those of the Polygonum Family. Flowers spring.

P. occidentàlis, Linn. American Plane, Sycamore, or Buttonwood. Well-known large tree by river banks, with white close bark separating in thin brittle plates; leaves truncate or heart-shaped at base, rather scurfy-downy until old, the short lobes sharp-pointed, and fertile heads solitary.

P. orientàlis, Linn. Oriental Plane, especially its var. acerifòlia, occasionally planted in this country, is very like ours, but is not so hardy, has leaves more cut and sooner smooth, the heads larger.

CVII. JUGLANDACEÆ, WALNUT FAMILY.

Trees with alternate pinnate leaves, no stipules, and monœcious flowers; the sterile ones in catkins with an irregular calyx and several stamens; the fertile single or 2 or more in a cluster, with a 3–5-lobed calyx, the tube of which is adherent to the ovary, sometimes bearing petals. Ovary incompletely 2–4-celled, but with only a single ovule, erect from its base, and ripens into a large fruit, the bony inner part of which forms the nut, the fleshy at length dry outer part the husk. Seed 4-lobed, filled with the fleshy and oily embryo, the large and separated cotyledons deeply 2-lobed and crumpled or corrugated.

1. JUGLANS. Sterile flowers in solitary catkins from the wood of the preceding year, each with 12–40 stamens on very short filaments. Fertile flowers on a terminal peduncle, with a 4-toothed calyx, 4 little green petals and 2 club-shaped and fringed conspicuous stigmas. Husk of the fruit drying up before splitting. Bark and shoots resinous-aromatic and strong-scented. Buds several, one over the other, the uppermost far above the axil (Lessons, Fig. 78). Pith in plates. Leaflets numerous.
2. CARYA. Sterile flowers in clustered lateral catkins, with 3–10 almost sessile anthers. Fertile flowers 2–5 in a cluster on a terminal peduncle; no petals; stigmas 2 or 4, large. Husk of the fruit splitting into 4 valves, and falling away from the smooth nut. Valuable timber and nut trees, with very hard and tough wood, and scaly buds single (Lessons, Fig. 73), from which are usually put forth both kinds of flowers, the sterile below and the fertile above the leaves.

1. JÙGLANS, WALNUT. (Name from *Jovis glans*, the nut of Jupiter.)

Flowers spring; fruit ripe in autumn. Seed sweet and edible.

* *Nut with rough and furrowed surface, from which the dried husk does not fall away; seed very oily.*

J. cinèrea, Linn. Butternut or White W. Middle-sized tree with smooth gray branches, growing from N. Eng. to Kan. and S.; stalks and shoots clammy-downy; leaflets downy, at least beneath, oblong-lanceolate, pointed, serrate; fruit oblong; nut with very rugged ridges.

J. Sieboldiàna, Maxim. JAPANESE W. Tree of medium to large size, with pubescent shoots and leaves; leaflets 11–17, large, elliptic-oblong and acuminate, sessile, sometimes not strictly opposite, rather coarsely serrate; fruits in long clusters of 10–20, inversely top-shaped when the husk is on, the shell thin and very little furrowed, the nude nut 1′–2′ long. Japan.

J. nìgra, Linn. BLACK W. Large tree, with dark rough branches; stalks and shoots not clammy, minutely downy; leaflets smoothish, ovate-lanceolate, serrate; fruit spherical (rarely ovoid and sometimes the husk striped). Mass., S. and W.

* * *Husk friable, separating when dry from the roundish and smoothish thin-shelled nut.*

J. règia, Linn. ENGLISH WALNUT, so called, but native of Asia; leaflets oval, entire, smoothish; fruit ripens sparingly in Middle States.

2. CÁRYA, HICKORY. (Greek name of the Walnut, applied to these North American trees.) Flowers in rather late spring; nuts fall in autumn.

* *Sterile catkins in a sessile cluster; leaflets* 13–15, *short-stalked; nut edible.*

C. olivæfórmis, Nutt, PECAN. Along rivers, from Ind. and Ia., S.; leaflets oblong-lanceolate, taper-pointed; nut cylindrical-oblong, olive-shaped, the seed delicious. Now cult. in the S.

* * *Sterile catkins* 3 *or more together on a common peduncle; leaflets sessile or nearly so, of* 5–9 *or rarely* 11–13 *leaflets; nut globular or short-oval.*

+– *Nuts sweet-tasted and edible (the hickory-nuts of the market); the husk splitting into* 4 *thick and hard valves; buds large, of about* 10 *scales.*

C. àlba, Nutt. SHELLBARK or SHAGBARK H. Bark of old trunks very shaggy, separating in rough wide strips; inner bud scales becoming very large and conspicuous on the young shoot; leaflets 5, the 3 upper much larger and lance-obovate; nut white, the meat high-flavored. N. Eng., W. and S.

C. sulcàta, Nutt. WESTERN or BIG SHELLBARK H., KINGNUT. Differs from the foregoing in lighter-colored heart wood, 7–9 leaflets more downy beneath; fruit with very thick husk 4-ribbed above the middle, and larger yellowish or dull-white nut (sometimes 2′ long) mostly with a point at both ends. N. Y., S. W.

C. tomentòsa, Nutt. MOCKER NUT or WHITEHEART H. Bark rough, but not splitting off in strips; shoots and lower surface of the leaves woolly-downy when young; leaflets 7–9, lance-obovate, or the lower lance-oblong; fruit with very thick hard husk, and globular nut (not flattish on the sides) brownish, very thick-shelled, hardly fit to eat. N. Eng., W. and S., commonly on rich hillsides.

C. microcárpa, Nutt. Bark somewhat shaggy, but separating in narrow thin plates; foliage glabrous; fruit rather small and thin-husked, edible, but not rich. N. Y. to Del. and Ill. Foliage and fruit smaller than C. alba.

+– +– *Nuts bitter, in a rather thin and friable husk, which splits only at the top, or tardily to near the base; bark on the trunk close; bud scales falling early.*

C. porcìna, Nutt. BROWN or BROOM H., PIGNUT. Bark of trunk rough and furrowed, but not separating in plates; bud scales about 10,

small; shoots and leaves nearly smooth; leaflets 5–7, obovate-lanceolate, fruit pear-shaped; nut oblong or oval, hard-shelled, seed at first sweet, then bitterish. Me., S. and W.

C. amàra. Nutt. Bitter Nut. Moist or low grounds, N. Eng., W. and S.; bark of trunk smooth and very close; yellowish bud scales about 6; shoots and leaves pubescent when young; leaflets 7–11, lanceolate or lance-oblong; fruit globular; nut white, thin-shelled, and tender, also globular; seed at first sweet, then very bitter.

C. aquática, Nutt. Water H. River swamps, S. Car., S. Small tree, with rough bark; bud scales as in the last; leaflets 9–13, lanceolate, smooth; nut thin-shelled, 4-angular, flattish; seed very bitter.

CVIII. MYRICACEÆ, SWEET GALE FAMILY.

Shrubs, with resinous-dotted often fragrant simple leaves, and monœcious or diœcious flowers solitary under a scale-like bract, both kinds in short scaly catkins or heads, and destitute of any proper calyx or involucre, the 1-seeded fruit a fleshy little drupe or at length dry nut, commonly coated with wax.

1. MYRICA. Flowers diœcious or monœcious, the catkins from lateral scaly buds; each flower with a pair of bractlets; the sterile of 2–8 stamens; the fertile of an ovary bearing 2 slender stigmas and surrounded by a few little scales.

1. MYRÌCA, BAYBERRY, SWEET GALE. (Ancient name of some aromatic shrub.) Flowers spring, with or earlier than the leaves.

* *Leaves entire or simply serrate; flowers mostly diœcious, the ovary with 2–4 scales at base and the nut globular.*

M. Gàle, Linn. Sweet Gale. Cold bogs N.; 1°–4° high, with pale wedge-lanceolate leaves, serrate towards the apex; little nuts crowded, and as if winged by a pair of scales.

M. cerífera, Linn. Bayberry, Wax Myrtle. Along the coast, Canada S., and on Lake Erie; shrub 2°–8° high, with fragrant lance-oblong or lanceolate mostly entire leaves, becoming glossy above, the scattered bony nuts thickly incrusted with greenish or white wax, and appearing like berries.

* * *Leaves pinnatifid; flowers mostly monœcious, the ovary with 8 long linear scales at base, the nut ovoid-oblong.*

M. asplenifòlia, Endl. Sweet Fern. In sterile soil, N. Eng. to Minn., and S.; 1°–2° high, with linear-lanceolate downy leaves, pinnatifid into many short and rounded lobes, resembling a Fern, and sweet-aromatic.

CIX. CUPULIFERÆ, OAK FAMILY.

Trees or shrubs, with alternate and simple straight-veined leaves, very deciduous stipules, and monœcious flowers; the sterile in slender catkins (except in the Beech); the fertile solitary, clustered or spiked, and furnished with an involucre which forms a cup or covering to the 1-celled 1-seeded nut, or in the Birches and Alders with no involucre. Fruit a rounded,

angled or winged nut, coming from an ovary with 2 or more cells having 1 or 2 ovules hanging from the summit of each; but all except one cell and one ovule are abortive. There is a calyx adhering to the ovary, as is shown by the minute teeth crowning its summit. Seed filled by the embryo, which has thick and fleshy cotyledons.

* *Sterile and fertile flowers in separate scaly catkins; fertile flowers with no calyx or involucre; fruit flat or winged, small; stigmas 2, thread-like.*

1. BETULA. Sterile catkins long and hanging, with 3 flowers under each shield-shaped scaly bract, each with a scale bearing 4 short stamens with 1-celled anthers. (Lessons, Fig. 207.) Fertile catkins stout; 2 or 3 flowers under each 3-lobed bract, each of a naked ovary ripening into a rounded broadly winged scale-like little key-fruit, tipped with the 2 stigmas.
2. ALNUS. Flowers much as in Betula, but usually a distinct 3–5-parted calyx; anthers 2-celled; oval fertile catkins composed of thick and at length woody persistent scales; and the little nutlets less winged or wingless.

* * *Sterile flowers in pendulous catkins, the fertile in a short cluster or head; the sterile consisting of a few short stamens partly adhering to the bract, and destitute of any proper calyx; the anthers 1-celled; fertile flowers in pairs under each bract of a head, spike, or short catkin, each with one or two bractlets, forming a foliaceous or sac-like involucre to the nut. Sterile catkins rather dense.*

3. CORYLUS. Scales of the sterile catkin consisting of a bract to the inside of which 2 bractlets and several stamens adhere. Fertile flowers in a little head, like a scaly bud; stigmas 2, long and red. Nut rather large, bony, wholly or partly inclosed in a leaf-like or tubular and cut-lobed or toothed involucre.
4. OSTRYA. Scales of the sterile catkin simple. Fertile flowers in a sort of slender catkin, its bracts deciduous, each flower an ovary tipped with 2 long slender stigmas and inclosed in a tubular bractlet, which becomes a bladdery greenish-white oblong bag, in the bottom of which is the little nut; these together form a sort of hop-like fruit.
5. CARPINUS. Sterile catkin as in Ostrya. Fertile flowers in a sort of slender loose catkin; each with a pair of separate 3-lobed bractlets, which become leaf-like, one each side of the small nerved nut.

* * * *Sterile flowers in hanging catkins or a pendulous head, with a distinct 4–7-lobed calyx and 8–20 slender stamens; fertile flowers 1–4 in a cup or bur-like involucre.*

\+ *Sterile flowers clustered in slender catkins; their bracts inconspicuous or deciduous.*

6. QUERCUS. Stamens 3–12. Fertile flower only one in the bud-like involucre, which becomes a scaly cup. Stigma 3-lobed. Nut (acorn) terete, with a firm shell, from which the thick cotyledons do not emerge in germination. (Lessons, Figs. 36, 37, 388.)
7. CASTANEA. Stamens 8–20. Fertile flowers few (commonly 3) in each involucre, one or more ripening; stigmas mostly 6 or 7, bristle-shaped. Nuts coriaceous, ovoid, when more than one flattened on one or both sides, inclosed in the hard and thick very prickly bur-like at length 4-valved involucre. Cotyledons somewhat folded together and cohering, remaining underground in germination.

\+ \+ *Sterile flowers in small heads on drooping peduncles.*

8. FAGUS. Calyx of sterile flowers bell-shaped, 5–7-cleft, containing 8–16 long stamens. Fertile flowers 2 together on the summit of a scaly-bracted peduncle; the innermost scales uniting form the 4-lobed involucre; ovary 3-celled when young, crowned by 6 awl-shaped calyx teeth and a 3-cleft or 3 thread-like styles; in fruit a pair of sharply 3-sided nuts in the 4-cleft soft-prickly rigid involucre. Cotyledons thick, somewhat crumpled together, but rising and expanding in germination. (Lessons, Figs. 31–33.)

1. BÉTULA, BIRCH. (The ancient Latin name.) Trees with slender spray (or a few low shrubs), more or less spicy-aromatic twigs, sessile scaly buds, flowers in early spring along with the leaves; the sterile catkins golden yellow; the fertile ones mostly terminating very short 2-leaved branches of the season.

* *Trunk with brown or yellow-gray bark, the inner bark, twigs and thin straight-veined leaves spicy-aromatic; petioles short; thick fruiting catkins with their thin scales rather persistent; fruit with narrow wing.*

B. lénta, Linn. Sweet, Black, or Cherry Birch. A rather large tree, 50°–75°, with fine-grained valuable wood, dark brown close bark on the trunk (not peeling in thin layers) and bronze-reddish twigs, very aromatic; leaves oblong-ovate and somewhat heart-shaped, sharply doubly serrate all round, soon glossy above and almost smooth; fruiting catkins oblong-cylindrical, the scales with divergent lobes. Rich woods, N. Eng., W. and S.

B. lùtea, Michx. f. Yellow or Gray Birch. Less aromatic; bark of trunk yellowish-gray and somewhat silvery, separating in thin layers; leaves duller, more downy, and rarely at all heart-shaped; fruiting catkins short-oblong, with thinner and narrower barely spreading-lobed scales. Same general range.

* * *Trunk with chalky-white bark peeling horizontally in thin sheets; leaves and narrow cylindrical smooth catkins slender-stalked; bracts falling with the broad-winged fruit.*

B. álba, Linn. European White Birch, but much cultivated, particularly the weeping and cut-leaved forms; tree 50°–60°, with open top, and small (in the normal form) leaves which are triangular-ovate with a truncate or rounded (or even somewhat cordate) base, and not strongly acuminate.

B. populifòlia, Ait. American White Birch, Gray Birch. Small slender tree, 15°–30°, with mostly larger dangling leaves than the last, very lustrous above, strongly triangular-ovate or diamond-ovate, the base slanting, and the apex very long-acuminate. Poor soils, N. Eng. to Del., and L. Ontario.

B. papyrífera, Marsh. Paper or Canoe Birch. Large tree, from upper part of Penn. N., mostly far N. and N. W.; with ovate and even heart-shaped leaves (dull and often pubescent beneath, and dark green above), and more papery bark than in White Birch, separating in ample sheets.

* * * *Trunk with greenish-brown bark, hardly peeling in layers, reddish twigs little aromatic, and oblong downy short-stalked catkins; wings of fruit broad.*

B. nìgra, Linn. River or Red Birch. Middle-sized tree of low river banks, commonest S. (but growing from Mass. to Minn. and S.); leaves rhombic-ovate, whitish and mostly downy beneath.

* * * * *Shrubs with brown tight bark, small thickish crenate leaves, and oblong or cylindrical glabrous mostly erect short-peduncled catkins.*

B. pùmila, Linn. Low or Dwarf Birch. Erect or ascending, 2°–8°; leaves obovate or orbicular, soft-downy beneath. Bogs, Conn., S. and W.

2. ÁLNUS, ALDER. (Ancient Latin name.) Small trees or shrubs, with narrow leaf-buds of very few scales and often stalked, and catkins mostly clustered or racemed on leafless branchlets or peduncles.

* *Flowers with the leaves in spring, the sterile from catkins which were naked over winter, while the fertile catkin was inclosed in a scaly bud.*

A. víridis, DC. Green or Mountain Alder. On mountains and far N.; 3°–8° high; leaves round-oval or ovate, glutinous; fruit with a broad thin wing.

* * *Flowers in earliest spring, much before the leaves, both sorts from catkins which have remained naked over winter; wing of fruit narrow and thickish.*

A. serrulàta, Willd. SMOOTH A. Common especially S. (Mass. to Minn., and S.); 6°–12° high, with obovate smooth or smoothish leaves green both sides and sharply serrate.

A. incàna, Willd. SPECKLED or HOARY A. Common N., along streams; 8°–20° high; with broadly oval or ovate leaves rounded at base, serrate, and often coarsely toothed, whitened and commonly downy beneath.

A. glutinòsa, Willd. Cult. from Eu., under several names, some forms cut-leaved; leaves round-obovate and scalloped, and finely sharp-toothed, a tuft of down in the axils of the veins beneath, the young growth and petioles glutinous.

3. CÓRYLUS, HAZELNUT, FILBERT. (Classical Latin name.) Shrubs, with flowers in early spring preceding the rounded-heart-shaped, doubly serrate, at first downy leaves. Edible nuts ripe in autumn.

C. Avellàna, Linn. EUROPEAN H., FILBERT or COBNUT. Occasionally planted; 6°–10° high, with bristly shoots, and smoothish deeply-cleft involucre about the length of the (1′ long) oval nut.

C. Americàna, Walt. AMERICAN H. Thickets; 4°–6° high, with more downy shoots, leaves, and involucre, the latter open down to the smaller globular nut in the form of a pair of broad cut-toothed leafy bracts. N. Eng. to Dak., and S.

C. rostràta, Ait. BEAKED H. Thickets and banks, mostly N.; 2°–5° high, with more ovate and scarcely heart-shaped leaves, the densely bristly involucre prolonged in a narrow curved tube much beyond the ovoid nut.

4. ÓSTRYA, HOP HORNBEAM. (Classical name.) Slender trees, with very hard wood; flowers appearing with the Birch-like leaves, in spring.

O. Virgínica, Willd. AMERICAN H., IRONWOOD or LEVERWOOD. Tree 20°–50° high, with brownish rough bark, and oblong-ovate taper-pointed sharply doubly-serrate leaves downy beneath, the sacs of the fruit bristly at base. Wood white. Common.

5. CARPÌNUS, HORNBEAM. (Ancient Latin name.) Low trees or tall shrubs, with furrowed trunks and very hard wood, the close gray bark and small leaves resembling those of the Beech; flowers with the leaves, in spring.

C. Caroliniàna, Walt. AMERICAN H., BLUE or WATER BEECH. Banks of streams N. Eng. to Minn., and S.; 10°–20° high; with ovate-oblong pointed doubly serrate leaves, becoming smooth, and halberd-3-lobed bracts of the involucre.

6. QUÉRCUS, OAK. (The classical Latin name.) Flowers in spring; acorns ripe in autumn. Natural hybrids occur.

§ 1. ANNUAL-FRUITED OAKS, *the acorns maturing the autumn of the first year, therefore on the wood of the season, usually in the axil of the leaves, out of which they are often raised on a peduncle; kernel commonly sweet-tasted; no bristles on the lobes or teeth of the leaves.*

* WHITE OAKS, *with lyrately or sinuately pinnatifid and deciduous leaves.*

+– *Leaves not glaucous or white beneath.*

Q. Ròbur, Linn. EUROPEAN or ENGLISH OAK. Large, strong tree; leaves small, sinuate-lobed, but hardly pinnatifid; acorn oblong, over 1′

long, one or a few in a cluster, which is nearly sessile in the axils in var. SESSILIFLÒRA, raised on a slender peduncle in var. PEDUNCULÀTA. Various forms are cult. for ornament, especially yellow-leaved and cut-leaved varieties. Eu.

+ + Leaves pale or whitish beneath.

Q. álba, Linn. WHITE OAK. Rich soil, Me. to Minn., and S.; large tree with whitish bark; leaves soon smooth, bright green above, whitish beneath, with 3–9 oblong or linear obtuse and mostly entire oblique lobes; the shallow rough cup very much shorter than the ovoid-oblong (about 1′ long) acorn; seed edible.

Q. stellàta, Wang. POST, ROUGH, BOX WHITE or IRON OAK. Small tree in barren soil, commonest S., with very durable wood; thickish leaves grayish-downy beneath, pale and rough above, sinuately 5–7-lobed, the lobes divergent and rounded, the upper pair larger and sometimes 1–3-notched; naked cup deep saucer-shaped, half or one third the length of the small acorn.

Q. macrocárpa, Michx. BUR OAK, OVER-CUP or MOSSY-CUP OAK. Middle-sized tree in fertile soil, commonest W., but occurs in N. Eng.; with obovate or oblong lyrately pinnatifid leaves of various shape, pale or downy beneath, smooth above; cup deep, thick and woody, from hardly 1′ to 2′ in diameter, covered with hard and thick pointed scales, the upper ones tapering into bristly points, making a mossy-fringed border; acorn 1′–1½′ long, half or wholly covered by the cup.

Q. lyràta, Walt. SOUTHERN OVER-CUP OAK. Large tree in river swamps, from N. Car., S. and W.; leaves crowded at the end of the branchlets, obovate-oblong, with 7–9 triangular and entire acute lobes, glossy above, whitish-downy beneath; cup sessile, globular, rough with rugged scales, almost covering the globular nut.

* * CHESTNUT OAKS, *with toothed or sinuate leaves, not lobed except slightly in the first species, white or whitish-downy beneath; cup hoary, about half the length of the oblong-ovoid edible acorn.*

+ Tall forest trees.

Q. bícolor, Willd. SWAMP WHITE OAK. Handsome tree, with leaves intermediate between the White and the Chestnut Oaks, being more or less obovate and sinuate-toothed, or some of them nearly pinnatifid, hoary with soft down beneath, wedge-shaped at base, the main veins only 6–8 pairs and not prominent; peduncle in fruit longer than the petiole; cup often mossy-fringed at the margin; acorn hardly 1′ long. Streams, banks, and swamps, Me. to Minn., and S.

Q. Michaùxii, Nutt. BASKET or COW OAK. Leaves oval or obovate, acute, blunt or even cordate at the base, dentate, rigid, very tomentose beneath; fruit short-peduncled, the cup shallow and without fringe, but covered with hard and stout acute scales; acorns 1½′ long. Large tree, growing in swamps and along streams from Del. and S. Ind., S.

Q. Prìnus, Linn. CHESTNUT OAK. Large, rough-barked tree, on banks and hillsides, from Mass. and N. Y., S.; leaves variable, thick, obovate, oblong or even nearly lanceolate, base acute or obtuse, undulately crenate-toothed, pale and minutely downy beneath; fruiting peduncles shorter than the leaf stalks; cup thick, generally tuberculate; acorn 1′–1¼′ long.

Q. Muhlenbérgii, Engelm. YELLOW OAK, CHESTNUT OAK. Leaves much like those of the Chestnut, 5′–7′ long, slender-stalked, oblong or lanceolate, acute, obtuse at the base, nearly equally and rather sharply toothed; cup nearly sessile, shallow and thin, with small appressed scales; acorn small, ½′–¾′ long. Rich lands, Mass. to Minn., and S.

+ + Bush, rarely tree-like at the West.

Q. prinoìdes, Willd. DWARF CHESTNUT OAK, or CHINQUAPIN OAK. Barren or sandy soil, ranging with the last; shrub 2°–4° high, with obo-

vate or oblong-sinuate leaves narrowed at base; and acorn and cup like that of Q. Muhlenbergii, but very much smaller; producing little abortive acorns in the axils of some of the scales of the cup.

* * * Live Oak, *with evergreen coriaceous leaves, not lobed.*

Q. vìrens, Ait. Live Oak. Barrens or sands along the coast, from Va., S.; small or large tree, or a mere shrub, with very durable firm wood, the branchlets and lower face of the small oblong entire (or rarely spiny-toothed) leaves hoary; conspicuous peduncle bearing 1–3 small fruits, with top-shaped cup and oblong acorn.

§ 2. Biennial-fruited Oaks, *the acorns not maturing until the autumn of the second year, and therefore borne on old wood below the leaves of the season, on short and thick peduncles or none; kernel always bitter; tip or lobes of the leaves commonly bristle-pointed.*

* Black and Red Oaks, *with long-petioled and sinuate-lobed or pinnatifid deciduous leaves.*

+– *Mature leaves smooth on both sides or nearly so, generally ovate, oblong, or some of the larger obovate in outline, and varying from sinuately to deeply pinnatifid, turning various shades of red or crimson in late autumn; wood coarse-grained.*

++ *Leaves with wedge-shaped base and short petiole, rather thick and coriaceous.*

Q. Catesbæi, Michx. Turkey or Barrens Scrub Oak. Small tree in pine barrens, N. Car., S.; leaves deeply pinnatifid or 3–5-cleft, the long and narrow or unequal lobes somewhat scythe-shaped and often nearly entire; cup very thick and of coarse scales, 1′ or less broad, half inclosing the ovoid nut.

++ ++ *Leaves mostly rounded or obtuse at the base, slender-petioled, thinner.*

Q. rùbra, Linn. Red Oak. Common in rich and poor soil in N. States; large open-topped tree, with dark gray smoothish bark, very coarse reddish wood, and thinnish moderately pinnatifid leaves; cup saucer-shaped, sessile or on a short and abrupt narrow neck, of fine close scales, very much shorter than the nearly oblong acorn, which is 1′ or less in length.

Q. coccínea, Wang. Scarlet Oak. Dry or barely moist soil, Me. to Minn., and S.; large tree with gray bark, the interior reddish, rather firm leaves more or less glossy above and deeply pinnatifid; cup coarse-scaly, top-shaped or hemispherical with a conical scaly base, covering half or more of the roundish acorn (this ½′–¾′ long).

Var. **tinctòria**, Gray. Quercitron, Yellow-barked, or Black Oak. Bark of trunk darker-colored, thicker, rougher, internally orange (quercitron), and much more valuable to the tanner and dyer; cup less top-shaped; leaves less pinnatifid or some of them barely sinuate, thinner, less glossy, and more like those of Q. rubra. Ranges with the species.

Q. palústris, Du Roi. Swamp Spanish or Pin Oak. Low grounds, Mass. to Minn., and S.; middle-sized tree, with less coarse wood, deeply pinnatifid smooth leaves with their divergent lobes separated by broad and rounded sinuses; cup flat-saucer-shaped, with a short scaly base or stalk, of fine scales, very much shorter than the roundish acorn, which is barely ½′ in length.

+– +– *Leaves downy beneath even when mature; cup saucer-shaped with top-shaped base.*

Q. falcàta, Michx. Spanish Oak. Dry soil, Long Island to Mo., and S.; large tree, with oblong leaves obtuse or rounded at base, 3–5-lobed

towards the top, grayish or yellowish-downy beneath, the lobes mostly narrow and entire or sparingly toothed and somewhat curved; acorn globular, hardly ½′ long.

Q. ilicifòlia, Wang. Bear or Black Scrub Oak. Sterile hills and barrens, mostly N. and W.; shrub 3°–8° high, straggling; leaves obovate with wedge-shaped base, above angularly 3–7-lobed, whitish-downy beneath; acorn ovoid, barely ½′ long.

* * Thickish-leaved Oaks, *some of them almost or quite evergreen at the South, coriaceous but deciduous N., entire, sparingly toothed, or barely 3-lobed at the summit.*

+– *Leaves widening upwards, where they are sometimes moderately 3–5-lobed; acorns globular, ovoid, small.*

Q. aquática, Walt. Water Oak. A small tree, with very smooth and glossy, obovate-spatulate, oblanceolate, or wedge-oblong leaves, long-tapering at base; cup saucer-shaped. Wet ground, from Del., S.

Q. nigra, Linn. Black-jack or Barren Oak. Barrens, from N. Y., S. and W.; low tree (8°–25° high), with wedge-shaped leaves widely dilated and mostly 3-lobed at summit, but often rounded at the narrow base, rusty-downy beneath, smooth and glossy above; cup top-shaped, coarse-scaly.

+– +– *Leaves generally entire, not widened upwards; acorns spherical, small.*

Q. imbricària, Michx. Laurel or Shingle Oak. A middle-sized tree, with laurel-like, lance-oblong leaves glossy above, more or less downy beneath; cup saucer-shaped or top-shaped. Rich soils, Penn., W. and S.

Q. cinèrea, Michx. Upland Willow Oak. Dry pine barrens, N. Car., S.; small tree or shrub; resembles Live Oak, but more downy, narrower-leaved, the cup shallow, and small acorn globular.

Q. Phéllos, Linn. Willow Oak. Sandy low woods from N. Y., S. and W.; a middle-sized tree, remarkable for its linear-lanceolate, smooth, willow-like leaves narrowed at both ends.

7. CASTÀNEA, CHESTNUT. (Classical name, taken from that of a town in Thessaly.) Flowers in summer, appearing later than the elongated strongly straight-veined and merely serrate leaves.

C. satìva, Mill. European Chestnut. Large tree, with oblong-lanceolate leaves, which are abruptly pointed or not long-petioled, the teeth rather small but ending in a prominent, generally somewhat incurved spine; when mature smooth and green both sides; nuts large, 2 or 3 in each involucre. Several varieties are cult. for the large nuts.

Var. **Americàna**, Watson. American C. Larger freer-growing tree, with mostly larger and broader and thinner leaves, which are prominently taper-pointed, the teeth large and crowned with longer and more spreading spines; nuts smaller but better. Also cult. in a few named varieties. Rocky woods, Me. to Mich., and S.

C. Japónica, Blume. Japanese C. Small tree, with narrow (oblong-lanceolate) small leaves which are truncate or cordate at the base, and white-tomentose beneath, mostly long-pointed, the teeth small and sharply awn-pointed. Somewhat planted for its very large nuts.

C. pùmila, Mill. Chinquapin. Sandy dry soil chiefly Penn., S. and W.; shrub or small tree, with lance-oblong leaves, whitish-downy beneath, and very sweet nut, solitary in the involucre, and therefore terete.

8. FÀGUS, BEECH. (Classical Latin name, from the Greek, alluding to the nuts being good to eat.) Flowers appearing with the (straight-veined and serrate) leaves, in spring.

F. ferrugínea, Ait. AMERICAN BEECH. Forest tree, with fine-grained wood, close and smooth light-gray bark, and light horizontal spray; the leaves oblong-ovate and taper-pointed, distinctly toothed, thin, their silky hairs early deciduous, the very straight veins all ending in the salient teeth; common on rich lands.

F. sylvática, Linn. EUROPEAN BEECH. Occasionally planted; is distinguished by broader and shorter, firmer, more hairy, and wavy-toothed leaves, some of the main veins tending to the sinuses. COPPER BEECH is a variety with crimson-purple foliage; there are also weeping forms.

CX. SALICACEÆ, WILLOW FAMILY.

Trees or shrubs, with bitter bark, soft light wood, alternate undivided leaves, either persistent or deciduous stipules, and dicœcious flowers; both kinds in catkins, one flower under each bract or scale, the staminate of naked stamens only, the fertile of a 1-celled ovary which becomes a 2–4-valved pod with 2–4 parietal or basal placentæ, bearing numerous seeds furnished with a tuft of long cottony down at one end.

1. SALIX. Scales of the catkins entire. Sterile flowers of few or rarely many stamens, accompanied by 1 or 2 little glands. Fertile flowers with a little gland at the base of the ovary on the inner side; stigmas 2, short, each sometimes 2-lobed. Catkins generally erect, appearing before, with or following the leaves. Shrubs or trees with lithe branches, mostly 1-scaled buds and narrow leaves.
2. POPULUS. Scales of the catkins cut or cleft at the apex. Flowers on a cup-shaped oblique disk. Stamens usually numerous. Stigmas long. Catkins drooping; flowers preceding the leaves, which are mostly broad. Buds scaly.

1. SÀLIX, WILLOW, OSIER. (The classical Latin name.) The Willows, especially the numerous wild ones, are much too difficult for the beginner to undertake. For their study the Manual must be used. The following are the common ones planted from the Old World, with some of the most tree-like wild ones.

* *Flowers earlier than the leaves; catkins sessile along the shoot of preceding year.*

S. viminàlis, Linn. BASKET W. or OSIER. Of Eu.; twigs used for basket work; has lance-linear, entire, slender-pointed leaves 3′–6′ long and satiny-white underneath. Stamens 2, separate. Occasionally planted.

S. purpùrea, Linn. Known by the reddish or olive-colored twigs, lateral catkins before the oblanceolate, serrulate, and glaucous leaves and with dark scales, red anthers, and sessile downy ovary. Stamens 2, but their filaments and often the anthers also united into one. Established on low grounds and banks in some places, and planted for basket and tying material; also ornamental forms, one of which is known as S. NAPOLEÒNIS. Eu.

S. Càprea, Linn. GOAT W. of Eu. In this country known chiefly in its weeping form (the KILMARNOCK WILLOW), and as a stock upon which

many other ornamental willows are grafted. Moderate-sized tree, with brown or reddish branches and thick oval or lance-oval wavy-margined and irregularly toothed leaves, which are white-tomentose below and short-stalked; young growth pubescent.

* * *Flowers slightly earlier than the leaves but rather late in spring, on lateral catkins which have 4 or 5 leafy bracts at their base.*

S. cordàta, Muhl. A common wild species along streams, badly named, as the leaves are seldom heart-shaped at base and generally lanceolate, often tapering to both ends, sharply serrate, smooth, pale or whitish beneath; stipules on young shoots conspicuous, ovate or kidney-shaped; ovary slender-stalked, tapering, smooth. Variable.

S. incàna, Schrank. (S. ROSMARINIFÒLIA of horticulturists.) Leaves long-linear, with somewhat revolute entire edges, white-cottony below, nearly sessile, dull-green above; catkins small and slender; young growth more or less cottony. Cult. for ornament, usually as a graft upon some other species.

* * * *Flowers in loose catkins terminating leafy lateral shoots of the season, therefore later than the leaves, in late spring or early summer.*

+– *Leaves remotely denticulate; stamens 2; capsule glabrous or silky.*

S. longifòlia, Muhl. LONG-LEAVED W. Banks N.; shrub, with very long lance-linear, nearly sessile leaves, grayish-hairy when young; catkins with narrow yellowish scales; the stalked ovary bearing large stigmas.

+– +– *Leaves closely serrate with inflexed teeth; capsule glabrous.*

+– +– *Stamens generally 2; leaves lanceolate and long-acuminate.*

S. frágilis, Linn. CRACK W. Leaves green and glabrous, pale or glaucous beneath, 3′–6′ long; stipules (if present) half-cordate; capsule long-conical, short-stalked. Tall tree, planted for shade and ornament. Eu.

S. álba, Linn. WHITE W. Leaves ashy-gray or silky-white on both sides except when old, 2′–4′ long; stipules ovate-lanceolate, deciduous; capsule ovate-conical, nearly or quite sessile. Eu. Very variable and much mixed with S. fragilis. Forms with yellow twigs (var. VITELLÌNA) are cultivated. Var. ARGÉNTEA, with very silver-gray foliage, is the S. REGÀLIS of horticulturists.

S. Babylónica, Tourn. WEEPING W. Planted from the Orient; a familiar tree, with very slender drooping branches, and linear-lanceolate leaves white beneath; in the monstrous variety called ANNULÀRIS, HOOP W., the leaves are curved into a ring.

+– +– *Stamens 3 or more; leaves often broader.*

S. nìgra, Marsh. BLACK W. River banks; 15°–50°; bark rough; narrow-lanceolate, taper-pointed leaves; 3–6 stamens; short-ovate pods.

S. pentándra, Linn. (S. LAURIFÒLIA of horticulturists.) BAY W. Handsome tree, planted from Eu. for the very glossy, lanceolate, taper-pointed leaves, of the same hue on both sides, the staminate catkins of golden-yellow flowers also handsome; stamens commonly 5; pods tapering.

S. lùcida, Muhl. AMERICAN BAY W. Grows in wet ground N.; like the last, but a shrub, with shorter catkins on a less leafy short branch.

2. PÓPULUS, POPLAR, ASPEN. (Classical name.) Quick-growing, soft-wooded trees, mostly with glossy dangling leaves.

* BALSAM POPLARS, *with more or less elongated resinous sticky buds.*

+– *Petioles terete or not prominently flattened.*

P. balsamífera, Linn. BALSAM POPLAR, TACAMAHAC. A tall upright tree, with a narrow straight top, growing in woods and along streams in

the N. States, and also in N. Eu. and Asia; leaves thick and firm, erect, whitened beneath, ovate-lanceolate or oval, tapering towards the top and sometimes at the base, finely and obtusely toothed; young branches nearly cylindrical. Also cult. in many forms, the marked types being: var. ***viminàlis***, Loudon, of moderate stature, sharply angled twigs and broad-lanceolate willow-like twigs; and var. *latifòlia*, Loudon (P. Nolestii of nurserymen), with large ovate or cordate-ovate rather blunt leaves.

Var. **cándicans**, Gray. Balm of Gilead. A strong-growing, spreading tree, frequently planted, and esteemed for its vigor and hardiness and the resinous fragrance of its large buds in springtime. Leaves are broad, heart-shaped, green above and veiny and rusty-white beneath, the leaf-stalk usually hairy and somewhat flattened. L. Ontario, Mich., etc. Rare wild.

+– +– *Petioles prominently flattened, so that the leaves dangle in the wind.*

P. laurifòlia, Ledeb. (P. Certinénsis.) Large tree, planted from Siberia; leaves broad-ovate in outline, with a rounded or tapering base and rather short point at the apex; the margin rather closely toothed, wavy; leaf-stalk comparatively short, only moderately flattened, gland-less at the top; stipules present and conspicuous; shoots slightly hairy.

P. monilífera, Ait. Cottonwood, Carolina Poplar. Leaves triangular-ovate in outline, with a straight or truncate base and a long point at the apex; margin coarsely scallop-toothed, plane; leaf-stalk long, much flattened beneath the blade of the leaf, and commonly bearing two or three gland-like bodies at its top; stipules absent or minute (falling early); shoots glabrous. Large tree; common.

P. nìgra, Linn. Black Poplar, of Eu. A medium-sized tree, very sparingly planted, with broadly triangular or diamond-ovate, small leaves, which are not deeply toothed, and commonly hairy young shoots. It is familiar in this country in the

Var. ***Itálica***, Du Roi. (P. dilatàta, P. fastigiàta.) Lombardy Poplar. A tree of very tall strict growth, glabrous young shoots, and more tapering base to the leaves. Probably Asian.

* * White Poplars or Aspens, *with short, non-glutinous, often pubescent buds.*

+– *Petioles terete.*

P. heterophýlla, Linn. Downy Poplar. 40°–80° high; leaves round-ovate or heart-shaped, with the sinus closed by the overlapping lobes, obtuse, serrate with incurved teeth, 3′–5′ long, white wool deciduous only with age, leaving traces on the veins beneath and on the petioles; fruiting catkins smooth. Swamps, Conn. to Ill., and S.

+– +– *Petioles strongly flattened (except in some forms of the first).*

++ *Leaves cottony, at least beneath, even when old.*

P. álba, Linn. Abele or White P. Tree planted from Eu., with spreading branches, roundish, slightly heart-shaped, wavy-toothed or lobed leaves soon green above, very white-cottony beneath; spreads inveterately by the root. Many varieties, of which the most marked is var. Bolleàna, with deeply lobed white-bottomed leaves, and a fastigiate habit.

++ ++ *Leaves cottony when unfolding, but soon smooth and green on both sides; bark smooth and close, greenish-white.*

P. tremuloìdes, Michx. American A. Small tree, common in woods N.; small roundish-heart-shaped leaves with small regular teeth; scales of catkins cut into 3 or 4 linear lobes, fringed with long hairs.

P. grandidentàta, Michx. Larger Am. A. Middle-sized tree, common in woods; larger roundish-ovate leaves with coarse irregular blunt teeth; scales unequally 5–6-cleft, slightly fringed. Weeping forms in cultivation.

Subclass II. MONOCOTYLEDONS (or Endogens).

Distinguished by having the woody matter of the stem in distinct bundles scattered without obvious order throughout its whole breadth, never so arranged as all to come in a circle; when abundant enough to form proper wood, as in Palms and the like, this is hardest and the bundles most crowded toward the circumference. Embryo with a single cotyledon; the first leaves in germination alternate. Leaves mostly, but not always, parallel-veined. Parts of the flower almost always in threes, never in fives. See Lessons, p. 138, and for style of vegetation, p. 26, Fig. 71.

The plants of this class may be arranged under three generally well-marked divisions.

I. Petaloideous Division.

Flowers with a perianth (calyx and corolla) which is usually (except in Rush-like plants) colored, not on a spadix.

CXI. HYDROCHARIDACEÆ, FROGBIT FAMILY.

Water plants, with dicœcious, monœcious, or polygamous flowers on scape-like peduncles from a sort of spathe of one or two leaves, or sessile, the perianth in the fertile flowers of 6 parts united below into a tube which is coherent with the surface of a compound ovary; stamens 3–12, sometimes monodelphous; stigmas 3 or 6. Fruit ripening under water.

* *Growing under water, the fertile flowers only rising to the surface; the sterile (not often detected) breaking off their short stalks, and floating on the surface around the pistillate flowers.*

1. ELODEA. Stems leafy and branching. Fertile flowers rising from a tubular spathe; the perianth prolonged into an exceedingly slender stalk-like tube, 6-lobed at top, commonly bearing 3–9 apparently good stamens; ovary 1-celled with a few ovules on the walls; style coherent with the tube of the perianth; stigmas 3, notched.
2. VALLISNERIA. Stemless; leaves all in tufts from creeping rootstocks. Fertile flowers with a tubular spathe, raised to the surface of the water on an extremely long and slender scape; tube of the perianth not prolonged beyond the 1-celled ovary, with 3 obovate outer lobes (sepals) and 3 small inner linear ones (petals), and no stamens. Ovules very numerous, lining the walls. Stigmas 3, sessile, 2-lobed. Fruit cylindrical, berry-like.

* * *Floating, spreading by proliferous shoots; leaves long-petioled, rounded heart-shaped.*

3. LIMNOBIUM. Flowers monœcious or dicœcious, from sessile or short-stalked leaf-like spathes, the sterile spathe of one leaf surrounding 3 long-pediceled staminate flowers, the fertile 2-leaved, with one short-pediceled flower. Perianth of 3 outer oval lobes (calyx) and 3 narrow inner ones (petals). A cluster of 6–12 unequal monadelphous stamens in the sterile flower; some awl-shaped rudiments of stamens and a 6–9-celled ovary in the fertile flower; stigmas 6–9, each 2-parted. Fruit berry-like, many seeded.

1. **ELODÈA** (or ANÁCHARIS), WATERWEED. (Greek: *marshy.*) Flowers summer. ♃

E. Canadénsis, Michx. Slow streams and ponds; a rather homely weed, with long branching stems, beset with pairs or whorls of pellucid and veinless, 1-nerved, minutely serrulate, sessile leaves ($\frac{1}{2}'$–$1'$ long), varying from linear to ovate-oblong, the thread-like tube of the yellowish perianth often several inches long.

2. **VALLISNÈRIA**, TAPE GRASS, EELGRASS of fresh water. (Named for *A. Vallisneri*, an early Italian botanist.) Flowers late summer. ♃

V. spiràlis, Linn. In clear ponds and slow streams, with bright green and grass-like linear leaves (1°–2° long), delicately nerved and netted; fertile scapes rising 2°–4° long, according to the depth of the water, afterwards coiling up spirally and drawing the fruit under water to ripen. The leaves of this and the preceding are excellent to show *cyclosis*.

3. **LIMNÒBIUM**, FROGBIT. (Greek: *living in pools.*) Flowers whitish, the fertile ones larger, in summer. ♃

L. Spóngia, Richard. Floating free on still water, N. J., W. and S.; rooting copiously; leaves $1'$–$2'$ long, purple beneath, tumid at base, with spongy air cells.

CXII. ORCHIDACEÆ, ORCHIS FAMILY.

Herbs, with perfect flowers of peculiar structure, the perianth adherent to the 1-celled ovary (which has numberless minute ovules on 3 parietal placentæ), its chiefly corolla-like 6 parts irregular, 3 in an outer set answering to sepals, 3 within and alternate with these answering to petals, one of these, generally larger and always different from the others, called the *labellum* or *lip;* the 1 or 2 stamens are *gynandrous*, being borne on or connected with the style or stigma (Lessons, Fig. 284); the pollen is mostly coherent in masses of peculiar appearance, celled *pollinia* (Lessons, Figs. 320, 321, 322). All perennials, and all depend more or less upon insects for fertilization. Beginners will not very easily comprehend the remarkable structure of most Orchideous flowers. There are numerous

species and hybrids in cultivation in choice greenhouses, but only the commonest or most conspicuous wild species are mentioned here.

* EPIPHYTE OR AIR-PLANT ORCHIDS. *Of these a great variety are cultivated in the choicest conservatories. We have one genus in the most Southern States.*

1. EPIDENDRUM. The 3 sepals and 2 petals nearly alike and widely spreading; the odd petal or lip larger and 3-lobed, its base united with the style, which bears a lid-like anther, containing 4-stalked pollen masses, over the glutinous stigma.

* * TERRESTRIAL ORCHIDS, *growing in the soil, in woods or low grounds, but sometimes leafless and parasitic on roots.*

\+ *Anther only one, but of 2 cells, which when separated (as in Orchis) must not be mistaken for two anthers; pollen collected into one or more masses in each cell; stigma a glutinous surface.*

\+\+ *Lip, or odd petal, sac-like and inflated.*

2. CALYPSO. Sepals and petals nearly similar, lanceolate and pointed. Lip larger than the other parts (¾′ long), Lady's Slipper-like and hairy inside. Pollen masses 2, waxy, each 2-parted, sessile. Delicate little plant with a 1-flowered scape, and a single radical leaf.

\+\+ \+\+ *Lip neither saccate nor spurred (or spur adnate to the ovary); anther inverted on the apex of the style, commonly attached by a sort of hinge; pollen 2 or 4 separate soft masses, not attached to a stalk or gland.*

= *Flowers mostly small, dull colored, in a spike or raceme on a brownish or yellowish leafless scape; pollen masses 4, globular, soft-waxy.*

3. APLECTRUM. Flowers as in the next, but no trace of a spur or sac, larger. Scape rising from a large solid bulb or corm, which also produces, at a different season, a broad and many-nerved green leaf.

4. CORALLORHIZA. Flowers with sepals and petals nearly alike; the lip broader, 2-ridged on the face below, from its base descending a short sac or obscure spur which adheres to the upper part of the ovary. Scape with sheaths in place of leaves; the root or rootstock thickish, much branched and coral-like.

= = *Flowers rather large; pollen masses soft, of lightly-connected powdery grains.*

5. ARETHUSA. Flower only one, on a naked scape; the 3 sepals and 2 petals lanceolate and nearly alike, all united at the base, ascending and arching over the top of the long and somewhat wing-margined style, on the petal-like top of which rests the helmet-shaped hinged anther, over a little shelf, the lower face of which is the stigma. Lip broad, erect, with a recurving rounded apex and a bearded crest down the face. Pollen masses 4, 2 in each cell of the anther.

6. CALOPOGON. Flowers 2, 3, or several, in a raceme-like loose spike; the lip turned towards the axis, diverging widely from the slender (above wing-margined) style, narrower at base, larger and rounded at the apex, strongly bearded along the face. Sepals and the 2 petals nearly alike, lance-ovate, separate and spreading. Anther lid-like; pollen masses 4.

7. POGONIA. Flowers one or few terminating a leaf-bearing stem; the sepals and petals separate; lip crested or 3-lobed. Style club-shaped, wingless; stigma lateral. Anther lid-like, somewhat stalked; pollen masses 2, only 1 in each cell.

\+\+ \+\+ \+\+ *Lip not spurred or saccate; anthers borne on the back of the style, below its tip, erect or inclined; the ovate stigma on the front. Flowers in a spike, small, white.*

8. SPIRANTHES. Flowers oblique on the ovary, all the parts of the perianth erect or conniving, the lower part of the lip involute around the style and with a callosity on each side of the base, its narrower tip somewhat recurved and crisped. Pollen masses 2 (one to each cell), each 2-parted into a thin plate (composed of grains lightly united by delicate threads), their summits united to the back of a narrow boat-shaped sticky gland set in the beaked tip over the stigma. Leaves not variegated.

9. GOODYERA. Flowers like Spiranthes, but the lip more sac-shaped, closely sessile, and destitute of the callous protuberances at base. Leaves variegated with white veining.

++ ++ ++ ++ *Lip produced underneath into a free honey-bearing horn or spur; pollen of each cell all connected by elastic threads with a central axis or stalk; the lower end of which is a sticky gland or disk, by adhesion to which the whole mass of pollen is dragged from the opening anther and carried off by insects.*

10. ORCHIS. The 3 sepals and 2 petals are conniving and arched on the upper side of the flower; the lip turned downwards (i.e. as the flower stands on its twisted ovary). Anther erect, its two cells parallel and contiguous; the 2 glands side by side just over the concave stigma, and inclosed in a sort of pouch or pocket opening at the top.

11. HABENARIA. Flower generally as in Orchis, but the lateral sepals commonly spreading; the glands attached to the pollen masses naked and exposed.

+ + *Anthers* 2 (Lessons, Fig. 234), *borne one on each side of the style, and a trowel-shaped body on the upper side answers to the third stamen, the one that alone is present in other Orchids; pollen powdery or pulpy; stigma roughish, not glutinous.*

12. CYPRIPEDIUM. Sepals in appearance generally only 2, and petals 2, besides the lip which is a large inflated sac, into the mouth of which the style, bearing the stamens and terminated by the broad terminal stigma, is declined. Pollen sticky on the surface, as if with a delicate coat of varnish, powdery or at length pulpy underneath.

1. EPIDÉNDRUM. (Name in Greek means *upon a tree*, i.e. an epiphyte.)

E. conópseum, Ait. S. Car., S. and W., on the boughs of Magnolia, etc., clinging to the bark by its matted roots, its tuberous rootstocks bearing thick and firm lanceolate leaves (1′–3′ long), and scapes 2′–6′ long, with a raceme of small greenish and purplish flowers, in summer. (Lessons, Fig. 88.)

2. CALÝPSO. (The goddess *Calypso.*)

C. boreàlis, Salisb. Local plant, in mossy bogs and woods, Me. to Minn.; corm solid; flowers handsome, large and showy, purple, pink and yellow, on a scape 3′–6′ high; leaf ovate and thin, petioled, with 3 ribs.

3. APLÉCTRUM, PUTTYROOT, ADAM-AND-EVE. (Name, Greek: *destitute of spur.*)

A. hyemàle, Nutt. Woods, in rich mold, N. Eng. to Minn., and S. in the mountains; scape and dingy flowers in early summer; the large oval and plaited-nerved petioled leaf appears towards autumn and lasts over winter; solid bulbs one each year, connected by a slender stalk, those of at least two years found together (whence one of the popular names), 1′ thick, filled with strong glutinous matter, which has been used for cement, whence the other name.

4. CORALLORHÌZA, CORAL ROOT (which the name means in Greek). No green herbage; plants probably parasitic on roots.

C. innàta, R.Br. Low woods, N. Eng. to Minn., and S. in the mountains; 3′–6′ high, yellowish, with 5–10 very small almost sessile flowers; lip 3-lobed or halberd-shaped at base; flowers in spring.

C. odontorhìza, Nutt. Rich woods, Mass. to Mich., and S.; 6′–16′ high, thickened at base, brownish or purplish, with 6–20 pediceled flowers, and lip not lobed but rather stalked at base, the spur obsolete.

C. multiflòra, Nutt. In dry woods, N. Eng., W. and S.; 9′–20′ high, purplish, stout, with 10–30 short-pediceled flowers, lip deeply 3-lobed, and adnate spur manifest.

5. **ARETHÙSA**. (*Arethusa*, the nymph.) Flowers late spring.

A. bulbòsa, Linn. A charming little plant, in wet bogs N.; consists of a scape 6′–10′ high rising from a solid bulb or corm, sheathed below with one or two green bracts, and terminated with the bright rose-pink flower 1′–2′ long.

6. **CALOPÒGON**. (Greek: *beautiful beard*, referring to the lip.) Flowers early summer.

C. pulchéllus, R.Br. Scape 1°–2° high, from a small solid bulb, slender, bearing next the base a long linear or lanceolate many-nerved grass-like leaf, and at the summit 2–6 beautiful pink-purple flowers (1′ broad), the lip as if hinged at its base, bearded with white, yellow, and purple club-shaped hairs. Bogs, N.; one of the common orchids.

7. **POGÒNIA**. (Greek: *bearded*, i.e. on the lip; this is hardly the case in most of our species.) We have several, but the only widely common one is

P. ophioglossoìdes, Nutt. Wet bogs, ranging with the Calopogon, and in blossom at the same time; stem 6′–9′ high, from a root of thick fibers, bearing an oval or lance-oblong, closely sessile leaf near the middle, and a smaller one or bract near the terminal flower, with sometimes a second flower in its axil; flower 1′ long, pale rose-color or whitish, sweet-scented; sepals and petals nearly alike; lip erect, beard-crested and fringed.

8. **SPIRÁNTHES**, LADIES' TRESSES. (Name Greek, denoting that the flowers are spiral; they often are apparently spirally twisted in the spike.) Flowers white. The species are difficult; the following are the commonest.

* *Flowers crowded in 3 ranks in a close spike; wet banks or bogs.*

S. latifòlia, Torr. Known by its oblong or lance-oblong leaves (1′–3′ long), all at the base of the scape, and narrow spike of small smooth flowers, early in June. Moist places, Vt. to Minn. and Del.

S. Romanzoffiàna, Cham. Cold bogs, N. Eng., W.; 5′–15′ high, with oblong-lanceolate or grassy-linear leaves, a dense spike of flowers at midsummer, all 3 sepals and 2 petals conniving to form an upper lip.

S. cérnua, Richard. 6′–20′ high, with lance-linear leaves, cylindrical often lengthened spike, and lower sepals not upturned but parallel with the lower petal or lip; flowers in autumn. Moist sandy places. Variable.

* * *Flowers in one straight or often spirally twisted rank, in summer.*

S. præcox, Watson. Wet grassy places from N. Eng., S.; stem 1°–2° high, towards its base and at the fleshy root bearing linear or lance-linear leaves, which mostly last through the flowering season; spike dense and much twisted, rather downy.

S. grácilis, Bigelow. Hills and sandy plains; scape slender, 8′–18′ high, bearing a slender spike; leaves all from the tuberous root, short, ovate or oblong, apt to wither away before the small flowers appear in late summer.

9. GOODYÈRA, RATTLESNAKE PLANTAIN. (*John Goodyear*, an English botanist.) Flowers small, in summer, greenish-white, spiked on a scape; the leaves all clustered at the root, ovate, small.

* *Lip strongly saccate, with a short and spreading or recurved tip.*

G. rèpens, R.Br. Evergreen woods, N.; 3′–8′ high, slender; flowers in a loose one-sided spike, with ovate recurved tip.

G. pubéscens, R.Br. 6′–12′ high; larger, with leaves more beautifully white-reticulated, and flowers not one-sided in the denser spike; lip globular, the tip very short. Rich woods.

* * *Lip barely saccate and tapering.*

G. Menzièsii, Lindl. Woods from N. Eng., W.; 9′–12′ high; leaves less reticulated; flowers loose in the spike, narrower and pointed in the bud, the lip hardly sac-shaped at the base and tapering to a narrow apex.

10. ÓRCHIS. (The ancient Greek name.) We have only two true Orchises, viz.,

O. spectábilis, Linn. SHOWY ORCHIS. Plant with 2 oblong-obovate, thick, glossy leaves (3′–5′ long) from the fleshy-fibrous root, and a leafy-bracted scape 4′–7′ high, bearing in a loose spike a few pretty flowers, pink-purple, the ovate lip white; in late spring. Rich woods, N. Eng., W. and S.

O. rotundifòlia, Pursh. Stem 5′–9′ high, 1-leaved at the base and naked above, the leaf orbicular to oblong, 3′ or less long; flowers rose-purple except the lip, which is white and spotted with purple. Woods and bogs, N. Eng., W.

11. HABENÀRIA, REIN ORCHIS. (Latin *habena*, a rein or thong, from the shape of the lip of the corolla in some species.) Flowers in a terminal spike, each in the axil of a bract, in late spring and summer. In all but one species the ovary twists and the lip occupies the lower or anterior side of the flower. (Lessons, Figs. 320–322.) The following is an easy arrangement of the commonest species.

* *Lip not fringed, often entire; flowers never rose or purple.*

+ *Stem leafy; leaves oblong or lanceolate; flowers small; anther cells nearly parallel.*

++ *Flowers yellow.*

H. íntegra, Spreng. Pine barrens from N. J., S.; resembles H. cristata, having small, bright, orange-yellow flowers, but the lip is ovate and entire or barely crenulate; one or two lower leaves elongated and acute, oblong-lanceolate, the others becoming bract-like; spur awl-shaped, descending.

++ ++ *Flowers white (greenish-white in the last).*

H. nívea, Spreng. Sandy bogs, Del., S.; 1°–2° high, all the upper leaves bract-like; flowers in a loose cylindrical spike, very small, different from all the rest in having the (white) ovary without a twist, and the linear-oblong entire lip with its long thread-like spur therefore looking inwards.

H. dilatàta, Gray. Resembles the next, grows in same places, but is commonly more slender and with linear leaves; flowers white and narrow, open, the lanceolate lip having a rhombic-dilated base; glands strap-shaped, large, approximate. Bogs, N.

H. hyperbòrea, R.Br. Cold low woods and bogs, N.; 6′–2° high, very leafy; leaves lanceolate; spike dense, often long; flowers greenish, the lanceolate lip like the other petals, spreading, entire, about the length of the incurved spur; glands orbicular.

+ + + Flowers green.

H. viréscens, Spreng. Stem 10′–20′ high, with a conspicuously bracted at length, long and loose spike of small flowers; the lip oblong, almost truncate at the apex, its base with a tooth on each side and a nasal protuberance on the face; spur slender, club-shaped. Wet places, N. Eng., W. and S.

H. bracteàta, R.Br. Cold damp woods N. (S. in the mountains); 6′–12′ high, with lower leaves obovate, upper reduced to bracts of the short spike, which are much longer than the flowers; lip truncate and 2–3-toothed at the tip, very much longer than the sac-shaped spur.

+ + Stem a naked scape; the leaves only 2 at the ground; flowers pretty large in a loose spike; anther cells widely diverging at their tapering or beak-like projecting base.

H. orbiculàta, Torr. Great Green O. Rich, mostly evergreen woods and hillsides N., and in the mountains S.; a striking plant; its exactly orbicular leaves 4′–8′ wide, bright green above and silvery beneath, lying flat on the ground; scape 1°–2° high, bracted, bearing many large greenish-white flowers in a loose raceme; sepals roundish; lip narrowly spatulate-linear and drooping; spur 1½′ long, carved, gradually thickened towards the blunt tip; flowers July.

H. Hoókeri, Torr. Smaller in all parts; flowers in June; the orbicular leaves only 3′–5′ broad and flat on the ground; scape naked, 6′–12′ high, bearing fewer yellowish-green flowers in a strict spike; sepals lance-ovate; lip lanceolate and pointed, incurved, the other petals lance-awl-shaped; spur slender, acute, nearly 1′ long. Swamps and damp woods, N. A variety (var. **oblongifòlia**, Paine) has oblong leaves.

** * Lip and often the other petals cut-fringed or cleft, shorter than the long curving spur; cells of the anther more or less diverging and tapering below, the sticky gland at their lower end strongly projecting forwards. These are our handsomest wild Orchises; all grow in bogs or low grounds; stems leafy, 1°–4° high.*

+ Flowers bright orange-yellow, in late summer; glands orbicular, projecting on the beak-pointed bases of the very diverging anther cells; ovary and pod long, tapering to the summit.

H. cristàta, R.Br. Leaves narrow, and flowers small; petals crenate, and the ovate lip with a narrow lacerate fringe; bracts nearly the length of the crowded flowers; incurved spur little longer than the lip. Bogs, N. J., S.

H. ciliàris, R. Br. Yellow Fringed O. Taller; 1½°–2° high; leaves oblong or lanceolate; spike short, of many crowded, very showy and much larger flowers; petals cut-fringed at apex, the oblong body of the lip (about half the length of the spur) narrower than the copious long and fine fringe; bracts shorter than the ovaries. N. Eng., S. and W.

+ + Flowers bright white, in summer; the lip fringe-margined but not cleft.

H. blephariglóttis, Torr. White Fringed O. Like the last, but rather smaller, 1° high, the fringe of the lance-oblong lip hardly equal to the width of its body. There is a form with less fringed lip. Peat bogs, N.

+ + + *Flowers greenish or yellowish-white, in late summer; glands oval or lanceolate, almost facing each other; spike long and loose.*

H. leucophæa, Gray. N. Y., W. and S.; 2°–4° high; leaves lance-oblong; flowers rather large, the fan-shaped lip 3-parted, $\frac{3}{4}'$ long, and many-cleft to the middle into a thread-like fringe.

H. lácera, R.Br. Ragged Fringed O. Lower, 1°–2° high; leaves lanceolate or oblong; petals oblong-linear, entire; divisions of the slender-stalked 3-parted lip narrow and slenderly fringed. Bogs N., also S., in high lands.

+ + + + *Flowers violet-purple, in summer; the lip fan-shaped, 3-parted nearly down to the stalk-like base, and the divisions more or less fringed.*

H. psycòdes, Gray. Smaller Purple Fringed O. Frequent in moist grassy places, especially N.; leaves oblong, above passing into lance-linear bracts; spike cylindrical, 4′–10′ long, crowded with smaller and fragrant flowers; lateral petals wedge-obovate, almost entire; lip spreading, only $\frac{1}{2}'$ wide, cut into denser fringe.

H. fimbriàta, R.Br. Larger Purple Fringed O. Lower leaves oval or oblong, upper few and small; raceme-like spike oblong, with rather few large flowers in early summer; petals oblong, toothed down the sides; lip almost 1′ wide, hanging, cut into a delicate fringe. Wet meadows N., also S. to N. Car.

H. peramnœa, Gray. Meadows and banks, Penn., W. and S., along and near the mountains; flowers of size intermediate between the two preceding, the broad wedge-shaped lobes of the lip moderately cut-toothed, but not fringed.

12. CYPRIPÈDIUM, LADY'S SLIPPER, MOCCASIN FLOWER. (Greek name for *Venus*, joined to that for *a slipper* or *buskin*.) Among the most ornamental and curious of our wild flowers, blooming in spring and early summer. Rootstocks very short and knotty, producing long and coarse fibrous roots. Many tropical species and hybrids are in cultivation. (Lessons, Fig. 284.)

* *The three sepals separate; stem leafy, one-flowered.*

C. arietìnum, R.Br. Ram's-head L. The smallest species, with slender stem 6′–10′ high, oblong-lanceolate leaves, and a dingy, purplish, drooping flower, the sac conical and in some positions resembling a ram's head, one sepal lance-ovate, the two others and the two petals linear. Cold woods and swamps, Me. to Minn.

* * *Two of the sepals united by their edges into one under the sac or slipper, but their very tips sometimes separate.*

– *Stem 1°–2° high, leafy to the 1–3-flowered summit; leaves lance-oblong or ovate, with many somewhat plaited nerves, more or less pubescent; sac or slipper horizontal, much inflated, open by a rather large round orifice.*

– – *Sepals and linear wavy-twisted petals brownish, pointed, larger than the sac.*

C. cándidum, Muhl. Small White L. Small, barely 1° high, slightly pubescent; sac like that of the next, but white-purple inside; sepals ovate-lanceolate. Bogs (rare), N. Y., W. and S.

C. parviflòrum, Salisb. Smaller Yellow L. Like the next, and in similar situations, but stems and leaves generally smaller, and flower about half the size, somewhat fragrant, the sac broader than high, deep yellow, and the lance-ovate sepals browner.

C. pubéscens, Willd. Yellow Lady's Slipper. Sac light yellow, higher than broad, convex above; sepals long-lanceolate; flowers early summer, scentless; woods and bogs N., and S. in the mountains. A leafy plant, 2° high.

++ ++ *Sepals and petals broad or roundish and flat, white, not larger than the sac.*

C. spectábile, Swartz. Showy L. In bogs and rich low woods N., and along the mountains S.; downy, 2° or more high, with leaves 6′–8′ long, white flowers with the globular lip ($1\frac{1}{2}$′ long) painted with pink-purple, in July. One of the handsomest and most interesting of all wild flowers.

+ + *Scape naked, bearing a small bract and one flower at summit.*

C. acaùle, Ait. Stemless L. Moist or sandy ground N., mostly in the shade of evergreens; scape 8′–12′ high; sepals and petals greenish or purplish, the latter linear, shorter than the rose-purple (often whitish), oblong-obovate, drooping sac, which is split down the front but nearly closed; flowers in spring.

CXIII. SCITAMINEÆ, BANANA FAMILY.

A group of tropical or subtropical perennial plants, with leaves having distinct petiole and blade, the latter traversed by nerves running from the midrib to the margin; flowers irregular, with a perianth of at least two ranks of divisions, below all combined into a tube which is adherent to the 3-celled ovary; the stamens 1–6 and distinct. We have two wild representatives on our southeastern borders; the many cultivated ones are chiefly grown for their ornamental foliage, and some of them are rarely seen in blossom. They are therefore seldom available for botanical study.

I. GINGER SUBFAMILY. Seeds, rootstocks, or roots hot-aromatic. Stamen 1, with a 2-celled anther, commonly embracing the style, but not united with it; staminodia sometimes present. Ginger is the dried rhizomes of Zíngiber officinàle of the tropics.

1. HEDYCHIUM. Flowers with a slender tube bearing 6 divisions which may be likened to those of an Orchideous flower, one (answering to the lip) much larger and broader than the 5 others, and a very long, protruding, reddish filament terminated by a yellow unappendaged anther sheathing the style up almost to the stigma.

II. ARROWROOT or INDIAN SHOT SUBFAMILY. No hot-aromatic properties, the thick rootstocks, etc., commonly containing much starch, from which genuine arrowroot is produced. Stamen 1, with a 1-celled anther. Arrowroot is the product of species of Maránta.

* *Capsule* 1-*celled and* 1-*seeded.*

2. THALIA. Stemless herbs, with an elongated scape and radical long-stalked leaves. Corolla tubular, the three exterior divisions similar and equal, the interior ones unequal (the anterior division broad and hooded, one elongated and clawed and one partly adnate to the stamen and furnished with two bristles on one side). Stigma 2-lipped.

* * *Ovary* 3-*celled* (*rarely* 2-*celled*), *the cells* 1-*ovuled.*

3. CALATHEA. Strong-growing ornamental-leaved plants with flowers in imbricated bracteate heads or cone-like spikes or rarely in somewhat lax spikes. Outer 3 segments of perianth lanceolate, the 3 inner ones irregular and obtuse. Corolla tube often slender. Staminodia present and petal-like.

* * * *Capsule* 3-*celled, the cells several-*∞*-seeded.*

4. CANNA. Mostly tall plants with showy flowers in an erect spike or raceme terminating the stem. Stamen a petal-like filament with the anther upon one side.

III. BANANA SUBFAMILY PROPER. Not aromatic or pungent. Stamens 5 with 2-celled anthers, and an abortive naked filament.

5. MUSA. Strong somewhat palm-like plants with flowers in long nodding bracteate spikes or racemes. Calyx tubular and elongated, 3–5-toothed and inclosing the small corolla. Fruit fleshy and indehiscent.

6. STRELITZIA. One cultivated species, with the scape bearing at apex an oblique or horizontal and rigid conduplicate spathe, from which several large and strange-looking blossoms appear in succession; the 3 outer divisions of the perianth 3′–4′ long, orange-yellow, one of them conduplicate and taper-pointed, and somewhat like the two larger of the bright blue inner set, or true petals, which are united and cover the stamens, the other petal inconspicuous.

1. HEDÝCHIUM, GARLAND FLOWER. (Greek, *sweet* and *snow*, referring to the fragrant white flowers of H. coronarium.) In greenhouses.

H. Gardneriànum, Roscoe. Stems 3°–5° high; leaves broadly lanceolate or oblong, clasping, 2-ranked; flowers light yellow, fragrant, in a large terminal spike. India.

H. coronàrium, Kœrn. Plant 2°–5°, with 2-ranked, oblong, sessile leaves, and large, snow-white, sweet flowers, the lip nearly 2′ wide. Often grown in conservatories with aquatics. E. Indies.

2. THÀLIA. (*J. Thalius*, a German botanist, died in 1588.)

T. dealbàta, Roscoe. Plant dusted over with a white powder; heart-ovate, long-petioled leaves all from the root; reed-like scape (3°–5° high) branching above into panicled erect spikes of small, much-bracted, purple flowers. Ponds and bogs, S. Car., S. and W.

3. CALATHÈA. (Greek: *a basket*, alluding either to the basket-shaped stigma or to the use of the leaves in basket-making in S. Amer.) The plants are generally known as MARANTAS. Natives of trop. Amer. Following are the commonest in greenhouses.

* *Leaves marked only by transverse bars.*

C. zebrìna, Lindl. The oblong leaves 2 or 3 feet long, purple beneath, the upper surface satiny and with alternating stripes of deep and pale green; flowers dull purple, inconspicuous, in a bracted head or spike near the ground on a short scape. The commonest species.

* * *Leaves margined, or marked by bands running lengthwise the blade.*

+– *Leaf margined with green, the face blotched.*

C. Makoyàna, E. Morr. (Maránta oliváris). Leaves small for the genus (6′–8′ long), oblong, mostly unequilateral; central part of the leaf semi-transparent and blotched with deep green between the veins, intermediate portion blotched with dull yellow and white; leaf stalks purplish.

+– +– *Leaf more or less regularly banded lengthwise.*

C.ròsea-pícta, Regel. Leaves nearly orbicular, rich glossy green, banded between the midrib and margin by a rose-colored zone; midrib rose-colored.

C. Vandenhéckei, Regel. Leaves rich dark green above, with lighter transverse shades, purplish beneath; midrib broadly margined with silvery-white, and the face marked by two bands of the same color.

C. Warscewíczii, Kœrn. Leaves large (often 2° long), velvety-green, with a feathery stripe of yellow-green running from base to apex upon either side of the midrib.

4. CÁNNA, INDIAN SHOT. (Name obscure.) The 3 small green leaves which remain on the capsule are the sepals. The showy parts of the flower, inside the petals, are the petal-like staminodia, the upper two or three of which are very prominent. Tropical (mostly American) plants, now much used in lawn decorations. The cultivated forms, which are much confused, are chiefly from the following:

* *Corolla lobes and staminodia united into a short tube, the two or three upper staminodia being developed.*

+– *Upper staminodia* 3.

C. Índica, Linn. Indian Shot. First species introduced; stem slender, glabrous and green, 3°–5° high; leaves oblong, acute, green, lower ones a foot long; flowers in a loose, simple raceme, with suborbicular green bracts; sepals green; petals pale green, lanceolate, 1½′ or less long; staminodia bright red, lip reddish-yellow, spotted with red. The Cannas known as C. limbàta or aùreo-vittàta (the upper staminodia red bordered with yellow), and C. coccínea (with red-tinged sepals and petals, and often bordered staminodia) are evidently forms of this species.

C. latifòlia, Miller (C. gigantèa). Stem very stout, often 10° or more high, pubescent; leaves oblong and acute, green, the lower ones sometimes 3°–4° long; flowers in a lax racemed panicle, the lower bracts brown and several inches long, but the uppermost oblong and green, and becoming less than an inch in length; sepals small, oblong, green; petals 2′ long, lanceolate, red-tinged; staminodia oblanceolate, bright red, large, the lip plain red and notched at the apex.

C. glaùca, Linn. Stem 5°–6°, green and glaucous, as are the leaves; the latter oblong-lanceolate and very acute, the lower ones 1½° long; racemes lax, either simple or forked; sepals lanceolate, small, green; petals 2′ or less long, lanceolate, yellowish-green; staminodia clear pale yellow, 3′ or less long, the lip linear and notched, pale yellow. C. Annèi is an offshoot or hybrid of this, and was the parent of many of the older tall Cannas.

+– +– *Upper staminodia usually* 2.

C. lùtea, Miller. (Comprising C. pállida with the upper staminodia pale yellow and red-spotted; and C. aurantìaca with red-tinged petals, upper staminodia and lip bright reddish-yellow, the lip spotted with red.) Stems slender, green and glabrous, 3°–4° high; leaves green, oblong and

acute, 1° long; raceme lax, simple or forked, the bracts small and obtuse, green; sepals very small (½′ long), oblong and greenish; petals lanceolate, about 1′ long, pale green; staminodia oblanceolate and pale yellow, 2′ or less long, the lip linear, notched, pale yellow, not spotted.

C. Warscewiczii, Dietr. Stem glabrous, 3°–4° high, light purple; leaves purple-brown, oblong and acute, 1½° or less long; raceme simple and rather dense, the bracts ovate, brown and very glaucous; sepals oblong-lanceolate, small, glaucous; petals lanceolate, red-tinged and glaucous, 2′ long; staminodia (sometimes 3) oblanceolate, 3′ or less long, sometimes obscurely notched, bright scarlet, the lip plain bright scarlet, and distinctly notched.

C. speciòsa, Roscoe. Stem 5°–6° high, green and glabrous; leaves green, broad-oblong and acute, the lowermost often 2° long; panicle deeply forked; sepals lanceolate and pale red; petals 2′ long, lanceolate, pale red; staminodia notched, bright red, 3′ long, the lip also notched at the apex, and bright reddish-yellow. Himalayas.

C. discolor, Lindl. Stem 5°–10° high, glabrous and glaucous, purple; leaves broad, oblong and acute, claret-brown, the lowermost sometimes 3° long; panicle deeply forked, the bracts orbicular; sepals small, lanceolate and green; petals lanceolate, pale green; staminodia oblanceolate and entire, bright red, 2½° long; lip lanceolate and notched, brick-red.

* * *Corolla tube 2′ or more long; upper staminodia 3, clawed; lip orbicular.*

C. flàccida, Salisb. Wild in swamps, S. Car., S.; 2°–4° high, with ovate-lanceolate, pointed leaves, and yellow flowers 3′–4′ long; all the inner divisions obovate and wavy, lax, the 3 corolla lobes reflexed.

* * * *Corolla tube as long as the blades of the staminodia; flowers large and pendulous.*

C. iridiflòra, Ruiz. & Pav. Stem 6°–10° high, green; leaves oblong, slightly pubescent beneath, bright green; panicle composed of several drooping racemes; sepals 1′ long, lanceolate, green; corolla lobes lanceolate, red-brown; staminodia 3, somewhat longer than the corolla lobes, bright red, the lip of the same color and notched.

C. Ehemánni of gardens is a hybrid of this and probably C. Warscewiczii. The modern race of dwarf and Crozy "flowering" Cannas is mostly sprung from this garden form again crossed, the red-flowered ones being mainly hybrids of C. Ehemanni and C. Warscewiczii, and the yellow-flowered ones largely of C. Ehemanni and C. glauca.

C. liliiflòra, Warsc. Similar to C. iridiflora in habit, but the flowers white and fragrant. Not yet common, but it will undoubtedly play an important part in garden forms in the future.

5. **MÙSA**, BANANA, PLANTAIN. (*Antonius Musa*, physician to Augustus.)

M. Sapiéntum, Linn. Banana. Cult. for foliage and for the well-known fruit; the enwrapping bases of the huge leaves forming a sort of tree-like, succulent stem, 10°–20° high; the flower stalk rising through the center, and developing a drooping spike, the flowers clustered in the axil of its purplish bracts; berry oblong, by long cultivation (from offshoots) seedless. (Lessons, Fig. 71.)

M. Cavendíshii, Lamb. A dwarf species, flowering at a few feet in height, is more manageable in greenhouses; leaves 2°–3° long. China.

M. Ensète, Gmel. Now very popular amongst gardeners, much used for planting out in summer; leaves nearly erect, 10°–16° long and 3°–4° wide, bright green, with a stout crimson midrib; stem 10°–20° high and becoming very thick. Abyssinia.

6. **STRELÍTZIA.** (*Charlotte of Mecklenburgh-Strelitz*, wife of George III.)

S. Regìnæ, Ait. Paradise or Bird's Tongue Flower. A large stemless conservatory plant, from the Cape of Good Hope, winter-flowering, with 2-ranked root-leaves, their long rigid petioles bearing an ovate-oblong thick blade.

CXIV. BROMELIACEÆ, PINEAPPLE FAMILY.

Tropical or subtropical plants (mostly herbs), the greater part epiphytes, with dry or fleshy, mostly rigid, smooth or scurfy leaves, often prickly edged, and perfect flowers with 6 stamens and 6-cleft perianth. Represented by several species of Tillandsia in Florida, a small one further north, and several species of various genera in choice conservatories.

Ánanas satìvus, Schult. (or Ananássa satìva). Pineapple. Cult. for its "fruit," which is a fleshy cone-like spike, comprising the fleshy berries and bracts; flowers abortive. It is sometimes grown for foliage, especially a striped-leaved variety. Trop. Amer.

Tillándsia usneoìdes, Linn. Long Moss or Black Moss. Hanging from trees in the low country from the Dismal Swamp, S.; gray-scurfy, with thread-shaped, branching stems, linear-awl-shaped recurved leaves, and small, sessile, green flowers; the ovary free, forming a narrow, 3-valved pod, filled with club-shaped hairy-stalked seeds; flowers summer. (Lessons, Fig. 88.)

CXV. HÆMODORACEÆ, BLOODWORT FAMILY.

Fibrous-rooted, herbaceous plants, with perfect and regular 3–6-androus flowers, which are scurfy or woolly outside; perianth tubular below and united with the 3-celled ovary, 6-lobed above; style 1, sometimes 3-parted; capsule loculicidal, 3–∞-seeded, crowned or inclosed by the persistent perianth; leaves usually equitant.

* *Calyx tube adherent to the whole length of the ovary; style not parted.*

1. LACHNANTHES. Flower woolly outside. Stamens 3, opposite the 3 inner divisions of the perianth, the filaments exserted, and the anthers fixed by the middle. Leaves equitant.

* * *Calyx tube joined only to the base of the ovary; style at length 3-parted.*

2. LOPHIOLA. Flower densely woolly outside. Stamens 6, included, inserted on the base of the perianth, the anthers fixed by the base. Leaves equitant.
3. ALETRIS. Flower scurfy-roughened outside. Stamens 6, included, inserted on the throat of the perianth. Leaves flat and spreading.

1. LACHNÁNTHES, REDROOT. (Greek; *woolly blossom.*) 2

L. tinctòria, Ell. Stem 2°–3° high; leaves sword-shaped, scattered on the stem and clustered at its base; flowers dingy yellow, in a terminal dense compound cyme. Sandy swamps, Mass., S.

2. LOPHÌOLA. (Greek: *small crest*, referring to a woolly tuft near the base of the perianth lobes.) 2

L. aùrea, Ker. Stem leafless and woolly above, creeping at the base, 2° high; leaves linear and nearly smooth; flowers dingy yellow inside, in a crowded cyme. Pine barrens, N. J., S.

3. ÁLETRIS, COLICROOT, STAR GRASS. (Name Greek, alluding to the apparent mealiness of the flowers.) Stemless, the flowers in a wand-like raceme; scape 2°–3° high, arising from a cluster of lanceolate leaves. 2

A. farinòsa, Linn. Flowers white, oblong-tubular, the perianth lobes lance-oblong. Woods, Mass. to Minn., and S.
A. aùrea, Walt. Flowers yellow and shorter, bell-shaped, the lobes short-ovate. Barrens, N. J., S.

CXVI. IRIDACEÆ, IRIS FAMILY.

Perennial herbs with bulbous, cormous (Lessons, Figs. 105, 106), or tuberous (sometimes fibrous) roots, distinguished by the equitant (Lessons, Figs, 164, 165), erect, 2-ranked leaves, and the 3 stamens with anthers facing outwards. Flowers perfect and showy, colored, mostly from a spathe of two or more leaves or bracts; the tube of the perianth coherent with the 3-celled ovary and often prolonged beyond it, its divisions 6 in two sets (answering to sepals and petals), each convolute in the bud. Style 1-, or rarely 3-cleft; stigmas 3, opposite the 3 stamens and the outer divisions of the perianth. Fruit a 3-celled and many-seeded pod. (Lessons, Figs. 395, 396.)

* *Spathe generally 2- or more-flowered (1-flowered in some Irises), terminal or pedunculate; flowers generally stalked in the spathe.*

+ *Perianth of 3 outer recurving, and 3 inner commonly smaller erect or incurving divisions; stigmas, or more properly lobes of the style, petal-like.*

1. IRIS. Flowers with tube either slightly or much prolonged beyond the ovary, in the latter case coherent also with the style. Stamens under the overarching branches of the style; anthers linear or oblong, fixed by the base. The real stigma is a shelf or short lip on the lower face of the petal-like branch of the style, only its inner surface stigmatic. Pod 3–6-angled. Roots rhizomatous or tuberous.

+ + *Perianth deeply cleft or parted into 6 widely spreading divisions; stamens monadelphous to the top; style long; stigmas 3 or 6, thread-like; flowers opening in sunshine and but once for a few hours.*

2. TIGRIDIA. From a corm with some hard brittle coating. Leaves lanceolate, large, very much plaited. Three outer divisions of the perianth very large and with a concave base; the other 3 very much smaller and fiddle-shaped. Stigmas 3, each 2-cleft.

3. SISYRINCHIUM. Root mostly fibrous. Leaves grass-like. Divisions of the wheel-shaped flower all alike. Stigmas 3, simple.

+ + + *Perianth parted almost to the base into* 6 *nearly equal widely spreading divisions; stamens separate or nearly so; style* 3–6*-lobed.*

4. NEMASTYLIS. Stem simple or sparingly branching above, from a corm. Divisions of the flower obovate. Filaments awl-shaped, much shorter than the linear anthers. Style short, its 3 lobes parted each into two, bearing long and thread-like diverging stigmas. Pod truncate. Seeds dry, angular.

5. BELAMCANDA. Foliage and aspect of an Iris with leafy branching stem, from a rootstock. Divisions of the flower oblong with a narrow base. Filaments slender, much longer than the anthers. Style long, club-shaped, its simple branches tipped with a broad and blunt stigma. Pod pear-shaped; the valves falling away expose the center covered with black berry-like seeds.

* * *Spathe* 1*-flowered, the flowers sessile in the spathe (except No.* 6.)

+ *Perianth regular or very nearly so, the stamens equilateral.*

++ *Plant stemless,* i.e., *the leaves and flowers arising directly from the corm.* (Lessons, Figs. 105, 106.)

6. CROCUS. Ovary and pod seldom raised above ground; perianth with a long and slender tube; its oval or roundish divisions alike, or the 3 inner rather smaller, concave, fully spreading only in sunshine. Leaves with revolute margins.

++ ++ *Plants with prominent stems.*

= *Three branches of the style not divided.*

7. SCHIZOSTYLIS. Root a scarcely thickened rhizome. Flowers spicate-scattered on the side of a simple peduncle, red and showy, the tube slender and somewhat enlarged at the throat, the perianth lobes oblong or ovate and widely spreading. Branches of the style long and subulate. Spathe greenish, lanceolate.

8. IXIA. Cormous plants, with showy flowers in simple or branched spikes. Perianth tube long and slender, the limb ascending or salver-shaped. Branches of the style linear, recurved. Spathe short and membranaceous.

= = *Branches of the style* 2*-divided or -cleft.*

9. FREESIA. Plants of small size, with coated corms and flowers erect in a secund lateral short raceme; perianth tube long and expanding upwards, generally curved, the lobes half-spreading. Spathe as in Ixia.

+ + *Perianth generally oblique, curved, or otherwise irregular; stamens mostly unilateral.*

++ *Flowers in short often secund racemes, or loose panicled spikes. Style branches not divided.*

= *Inflorescence dense, pilose.*

10. BABIANA. Cormous plants, with flowers of striking colors and usually pilose leaves and stem. Flowers in a simple short pilose spike-like cluster or raceme, the tube generally short, erect, the lobes erect-spreading, and clawed or contracted at the base. Small plants, with plaited leaves.

= = *Inflorescence mostly looser, essentially glabrous.*

11. CROCOSMA. Cormous, with a slender stem ending in a lax panicle. Perianth tube slender, cylindrical and curved, not dilated at the throat, the lobes spreading in star-like form. Stigmas dilated and denticulate. Leaves sheathing much of the base of the stem.

12. TRITONIA. Cormous, mostly rather tall. Flowers showy, mostly in loose racemes, these either solitary and terminal, or spiked. Perianth with a slender tube either short or long, and which is not prominently dilated above, the lobes nearly equal or oblique and concave or bell-form-spreading. Branches of the style slender, thickened or dilated at the apex. Spathe short and membranaceous, often toothed.

13. SPARAXIS. Cormous, small, nearly simple plants, with few yellow scattered or loosely spicate yellow flowers. Perianth tube short, dilated in the throat, the limb somewhat unequal, the lobes erect-spreading. Branches of the style slender. Spathe broad and scarious, more or less striate, fimbriate at the apex.

++++ Flowers numerous in a stiff terminal generally 1 sided spike.

14. GLADIOLUS. Cormous. Stem rather tall, leafy; flowers irregular, the short-funnel-shaped tube being somewhat curved, and the divisions more or less unequal, the flower commonly oblique or as if somewhat 2-lipped. Perianth tubular at base, the 6 divisions all more or less spreading. Stamens separate. Style long. Stigmas 3, more or less dilated. Stamens (inserted on the tube) and style ascending. Leaves sword-shaped, strongly nerved.

1. IRIS, FLOWER-DE-LUCE, BLUE FLAG. (Greek, the *rainbow*.) Many interesting and curious species cultivated in choice collections. Flowers spring and early summer. (Lessons, Figs. 58, 59, 395, 396.)

§ 1. IRIS proper, *with creeping rootstocks or rarely the root fibrous. (Native species of our region belong here.)*

* *Tall, the several-flowered often branching stems 1°–3° high; tube of the flower short; flowers late spring and summer.*

+– *Outer divisions (or "falls") of the perianth beardless and crestless.*

++ *Flowers yellow.*

I. Pseudácorus, Linn. YELLOW IRIS. Wet marshes in Eu., with very long linear leaves and bright flowers, is sparingly cultivated, and sometimes spontaneous.

++ ++ *Flowers copper-colored or dull reddish-brown.*

I. fúlva, Ker. (I. CÙPREA.) Flowers 2′ long, the tube about the length of the 6-angled ovary, the divisions spreading; ovary 6-angled and not surpassing the tube of the perianth. Swamps, S. Ill., S.

++ ++ ++ *Flowers in shades of blue or purple (rarely white), sometimes spotted and streaked.*

= *Leaves flat and broad, sword-shaped.*

I. lævigàta, Fisch. & Mey. (I. KÆMPFERI). JAPANESE IRIS. Tall species (2°–3° high), with very large flowers, which are often or commonly borne singly, and which, in some garden varieties, measure 8′–10′ across, and are broad and flat; outer lobes of the perianth mostly purple with a yellow blotch at the base and often streaked, very large and rounded; inner divisions commonly bright purple; leaves thin and pale green; stem glaucous. Cultivated (from Japan) in many forms and colors. Rhizome short and stout.

I. tripétala, Walt. In pine barren swamps, N. Car., S.; with rather short sword-shaped glaucous leaves, and few blue flowers (2′–3′ long), variegated with yellow and purple, the inner divisions very short and wedge-shaped, the tube shorter than the 3-angled ovary.

I. versícolor, Linn. LARGER BLUE FLAG. Stout; stem angled on one side; leaves sword-shaped, ¾′ wide; flowers light blue, variegated with some yellow, white, and purple, hardly 3′ long, the inflated tube shorter than the obtusely 3-angled ovary; pod oblong, 3-angled, the seeds more or less 2-rowed in each cell. Common in swamps.

I. Caroliniàna, Watson. In N. Car.; like the last, but the leaves long and lax, and greener, and the larger seeds in a single row in each cell.

= = *Leaves linear, sometimes stiffish.*

I. prismática, Pursh. (I. VIRGÍNICA). SLENDER BLUE FLAG. Slender, with very narrow leaves, and blue flowers with some white (barely 2′ long), on slender peduncles, with hardly any tube beyond the 3-angled ovary. Me. to N. Car.

I. gramínea, Linn. Root leaves 2°–3° long, and often surpassing the 1–3-flowered stem; flower purple-blue, with yellow in the throat, slightly fragrant, with narrow divisions. Cult. S. Eu.

I. tuberòsa, Linn. Snake's-head Iris. Leaves very long, often twice or thrice longer than the 1-flowered stem (which is 12′–18′ high); inner perianth divisions erect and light colored, the outer drooping and black-purple; root short, almost bulb-like. S. Eu.

+ + *Outer divisions of the perianth bearded or crested.*

++ *Flower mostly solitary and terminal, very large, streaked with brown-black.*

I. Susiàna, Linn. A curious species from Persia, not quite hardy in the N. States; all divisions of the perianth large and limp, rounded, about equal in size, marked with dark spots and lines on a lilac-white ground. Stem 10′–18′ high, at flowering time (early spring), exceeding the broadish leaves.

++ ++ *Flowers generally few or several, of ordinary size.*

= *Body color of the flowers blue or violet.*

I. hexágona, Walt. S. Car. and S., near the coast; with simple stem, narrowish long leaves, and deep blue variegated flowers, 4′ long, the outer divisions crested, the tube longer than the 6-angled ovary.

I. Germánica, Linn. Common Flower-de-Luce of the gardens, with very large, scentless flowers, the deep violet pendent outer divisions 3′ long, the obovate inner ones nearly as large, lighter and bluer. Eu.

I. sambùcina, Linn. Elder-scented F. Taller, 3° or 4° high, and longer-leaved; the flowers about half as large as in the preceding, the outer divisions less reflexed, violet, but whitish and yellowish toward the base, painted with deeper-colored lines or veins; upper divisions pale grayish- or brownish-blue; spathe broadly scarious-margined. S. Eu.

I. squàlens, Linn. Very like preceding, with longer dull violet outer divisions to the flower whitish and striped at base, and purplish-buff-colored inner divisions. Eu. and Asia.

= = *Body color of the flowers white, mostly with markings of yellow.*

I. variegàta, Linn. Flowers small, with spatulate-obovate divisions 2′ long, white with pale yellow, the outer divisions veined with dark purple and purplish-tinged in the middle. Eu.

I. Florentìna, Linn. Florence or Sweet F. Stems 2°–3° high, with broad leaves, and white faintly sweet-scented flowers, bluish-veined, the obovate outer divisions 2½′–3′ long, with yellow beard. Its violet-scented rootstock yields *orris root*. S. Eu.

* * *Dwarf, with simple very short stems (or only leafy tufts), 1–3-flowered in early spring, from creeping and branching slender (or thickened in I. pumila) rootstocks, here and there tuberous-thickened; flowers violet-blue, with a long slender tube.*

+ *Outer perianth lobes crestless.*

I. vérna, Linn. Slender Dwarf Iris. Wooded hillsides, from Penn. and Ky., S.; with linear grassy leaves, tube of flower about the length of its almost equal divisons, which are on slender orange-yellow claws, the outer ones crestless.

+ + *Outer lobes crested.*

I. cristàta, Ait. Along the Alleghanies, and W., sometimes cult.; with lanceolate leaves, or the upper ovate-lanceolate; tube of flower (2′ long), much longer than the scarcely stalked divisions, the outer ones crested; pod sharply triangular.

I. pùmila, Linn. DWARF GARDEN IRIS. Stem very short (4′–6′ high); the violet and purple flower close to the ground, with slender tube and obovate divisions hardly exceeding the short sword-shaped leaves. Eu.

§ 2. XIPHION; *the roots bulbous, giving rise to a single stem.*

* *Leaves at flowering time only 2′ or 3′ long.*

I. Pérsica, Linn. PERSIAN IRIS. A choice tender plant, dwarf, nearly stemless, the flower on a long tube, earlier than the leaves, delicately fragrant, bluish, with a deep-purple spot at the tip of the outer divisions, the inner divisions very small and spreading.

* * *Leaves a foot or more long at flowering time.*

+ *Flower with a prominent tube (2′–3′ long).*

I. reticulàta, Bieb. From Persia; stem a foot or so high, the leaves equaling the flowers and finally surpassing them; flower one, rather large with narrow divisions, violet-purple, the limb spotted with violet and streaked with yellow; flowers very early; leaves generally 2 together.

+ + *Flower with scarcely any tube.*

I. Xíphium, Linn. (I. VULGÀRIS of gardeners). SPANISH I. Leaves 4–6 on the stem, remaining green during winter; the stem 1°–2° high and sometimes 2-flowered; flowers 3′–5′ across, the outer divisions orbicular and reflexed, the inner ones erect, all purple and veiny; spathes 3′–4′ long, not inflated. Flowers coriander-scented. Spain.

I. xiphioìdes, Ehrh. (I. ÁNGLICA.) S. Eu.; 3 or 4 leaves on the stem and about 6 at its base, larger than in the last and not persisting during winter; plant 1°–2° high, 2–3-flowered; flowers large, lilac-purple, more or less marked with yellow and feathered with white on the face of the round-oblong outer divisions; tubers larger and rounder than in the last; spathe 3′–4′ long, inflated. Flowers scentless, later than the last.

2. TIGRÍDIA, TIGER FLOWER (as the name denotes). Flowers summer.

T. Pavònia, Ker. From Mexico, the principal species, with several varieties, planted out for summer flowering, sends up a stem 2° high, bearing in succession a few very large showy flowers 5′ or 6′ across, purple or orange-red, the dark center gaudily spotted with crimson or purple. T. CONCHIFLÒRA of gardens is a form with bright yellow flowers. T. GRANDIFLÒRA is a form with very large, bright orange-red flowers.

3. SISYRÍNCHIUM, BLUE-EYED GRASS. (Greek: *hog's snout*, the application not apparent.) Flowers all summer.

S. angustifòlium, Mill. Scape 4′–12′ high, simple, with a solitary terminal spathe, the outer bract more or less elongated; flowers blue (rarely white) changing to purple, the divisions notched or jagged and bristle-pointed; seeds large and globose, nearly smooth. Grassy plants, growing in little clumps or tufts; common.

S. ánceps, Cav. Usually taller and branching, the spathes 2 or more; seeds small and ovate, deeply pitted. Common.

4. NEMÁSTYLIS. (Greek: *thread-like style*, applicable here to the stigmas.) Flowers spring and summer.

N. cœlestìna, Nutt. Pine barrens S. Car., S.; 1°–2° high, with handsome but fugacious bright blue flowers; the leaves mainly from the small bulb, linear and plaited.

5. BELAMCÁNDA (or PARDÁNTHUS), BLACKBERRY LILY. (East Indian name.) Flowers late summer.

B. Chinénsis, Adans. China; cult. in country gardens and escaping into roadsides; 3°–4° high, more branching than an Iris; the divisions of the orange-colored flower (1′ long) mottled above with crimson spots, the fruit, when the valves fall and expose the berry-like seeds, imitating a blackberry, whence the common name.

6. CRÒCUS. (Greek name of *Saffron.*) Cultivated from Eu. and W. Asia. (Lessons, Figs. 105, 106.)

* *Spring flowering.*

+– *Yellow-flowered.*

C. Susiànus, Ker. CLOTH OF GOLD CROCUS. Leaves 6–8 in a tuft, reaching the flower, narrowly linear, the edges revolute and the center with a white stripe; perianth tube exserted, the segments 1½′ or less long, bright orange-yellow and soon reflexed, the outer ones flushed or brown-striped on the outside; anthers orange, longer than the glabrous filaments; style branches exceeding the anthers. Crimea.

C. mœsiàcus, Ker. DUTCH C. Later flowered; leaves 6–8 in a tuft, surpassing the flower, narrowly linear, the edges reflexed, and a white stripe; perianth tube 2–3 times longer than the limb; flower bright yellow, the segments very obtuse, not striped (a striped variety); anthers pale yellow and somewhat hastate at the base, somewhat longer than the papillose filaments; style branches not equaling the anthers. Greece to Asia Minor. There is a form with cream-white flowers.

C. STELLÀRIS, with fewer leaves in a tuft, little exserted perianth tube, flowers bright orange and the outer segments striped and feathered on the back, anthers pale yellow and longer than the glabrous filaments, and style branches somewhat exceeding the anthers, is a supposed hybrid of the above, known only in cultivation.

+– +– *Lilac- or white-flowered.*

C. biflòrus, Miller. SCOTCH C. Leaves 4–6 in a tuft, surpassing the flowers, white-striped and very narrow; tube exserted, the upper segments 1½′ or less long, tinged with purple, the lower ones with 3 purple stripes down the back; throat slightly bearded, yellowish; anthers orange, longer than the papillose orange filaments; style branches orange-red. Sterile. Variable.

C. versícolor, Ker. Leaves 4–5, like the last; tube exserted; upper segments either pale or dark purple, the lower ones purple outside and also purple-marked; throat glabrous, whitish or yellow; anthers yellow, twice longer than the white filaments; style branches yellow. S. Eu.

C. vérnus, All. Leaves 2–4, equaling the flower, glaucous beneath; segments 1′–1½′ long, lilac or white and often striped with purple; throat pubescent, not yellow; anthers lemon-yellow, longer than the white filaments; style branches orange-yellow. Eu. The commonest species.

* * *Autumn flowering.*

C. satìvus, Linn. FALL CROCUS. With violet purple and fragrant flowers, in autumn, is rarely seen here. Its long and narrow orange-red stigmas are *saffron*. Asia Minor.

7. SCHIZÓSTYLIS. (Greek: *cut style*, referring to the 3 long branches.)

S. coccínea, Backh. & Harv. CRIMSON FLAG, KAFFIR LILY. Not very tender, with long and keeled linear leaves, and stems 3° high, bearing a

spike of bright crimson-red flowers 2′ across, the ovate acute lobes all alike and widely spreading from a narrow tube; the slender style deeply cleft (whence the name) into 3 thread-like branches. S. Africa.

8. ÍXIA. (Greek for *birdlime*, referring to the clammy juice of some species.) Cape of Good Hope.

* *Perianth tube short and cylindrical.*

+– *Filaments distinct.*

++ *Flowers with a black-purple throat.*

I. maculàta, Linn. (I. cónica.) Stem terete and slender, sometimes branched, 1°–2° high; flowers many in dense erect spikes; perianth tube twice longer than spathe, the bell-form limb yellow and an inch or less long.

I. viridiflòra, Lam. Stem long and slender (1½°–3°), simple; flowers many in a long spike; perianth tube little longer than the spathe, the limb pale green.

I. hýbrida, Ker. A foot high, slender, the raceme flexuose and many-flowered; flowers white, with a tinge of pink, small.

++ ++ *Flowers with no marking in the throat.*

I. pàtens, Ait. Stem terete, 12′–20′ high, often branched; flowers many in rather dense spikes, the bell-form limb pale red; perianth tube little longer than the spathe; radical or basal leaves usually 4.

I. speciòsa, Andr. (I. crateroìdes.) Stem slender and terete, commonly simple, 6′–15′ high; flowers few in an erect spike, the tube little longer than the spathe, and the limb dark crimson; basal leaves 5 or 6.

+– +– *Filaments more or less united.*

I. monadélpha, Delar. Stem 10′–20′ high, slender, simple or branched; flowers few in a short spike, the tube often twice as long as the spathe, the limb lilac, throat greenish or blue. There are varieties with purplish flowers (var. purpùrea), with yellow and black-blotched flowers (var. versícolor), etc.

* * *Perianth tube dilated into funnel-shape at the top.*

I. odoràta, Ker. (I. erécta.) Stem slender and terete, branched; flowers fragrant, in a short spike, yellow.

9. FRÈESIA. (Derivation unknown.) Popular plants for forcing, from Cape of Good Hope.

F. refrácta, Klatt. Stems slender, often branched, 12′–20′ high, the flowers at its top in a slender secund, nearly horizontal raceme; flowers white marked by violet lines or yellowish, or pure white (var. álba), 2′–3′ long, very fragrant, gradually narrowed into a very slender tube, the lobes spreading; leaves flat.

F. Leichtlínii, Klatt, perhaps a form of the above, has pale yellow flowers which are abruptly narrowed into a short tube, the lobes more erect.

10. BABIÀNA. (Said to come from the Dutch word for *baboon*, because the bulbs are eaten by that animal.) Cape of Good Hope.

* *Perianth nearly rotate.*

B. stricta, Ker. (B. purpùrea.) Stem 12′–20′ high; basal leaves ensiform and hairy, not reaching the spikes, the latter 1–3, moderately

dense and many-flowered; perianth usually lilac-red, the tube as long as the spathe, and the lobes oblong-lanceolate. There are many forms, as var. RÙBRO-CYÀNEA, with lilac-red limb and bright red throat, and var. SULPHÙREA, with flowers milk-white or sulphur-yellow.

* * *Perianth distinctly ringent.*

+– *Segments oblong.*

B. plicàta, Ker. (B. PUNCTÀTA, B. FRÀGRANS.) Stem mostly shorter than the hairy lanceolate leaves; flowers in a simple or forked spike, reddish or lilac, with the tube as long as the spathe.

B. dísticha, Ker. Differs from the above chiefly in its longer perianth tube, which is distinctly projected from the spathe.

+– +– *Segments oblong- or lingulate-clawed.*

B. rígens, Ker. Stem 1°–1½° high, pilose; leaves linear and glabrous, many, thick; flowers 8–12 in a dense 1-sided spike, red with a greenish tube, the latter rather longer than the spathe.

11. CROCÓSMA. (Greek for *saffron smell*, alluding to the odor of the dried flowers.) Cape of Good Hope.

C. aùrea, Planch. The only species; stem terete and branched, 2°–4° high, with a few small leaves; spikes lax and few-flowered, flexuose; flowers brownish-yellow, the tube an inch or less long.

12. TRITÒNIA. (*Triton*, a *vane*, alluding to the variable directions of the anthers in different species.) Cape of Good Hope. In gardens, more often known as MONTBRÈTIA.

* *Perianth segments equal, oblong; flowers small.*

T. scillàris, Baker. (ÍXIA SCILLÀRIS.) Stem 1°, slender, simple or branched; basal leaves 4–6, plane, linear; spike 3′–4′ long, lax and flexuose; flowers pink, the tube cylindrical and somewhat longer than the spathe.

* * *Perianth segments more or less unequal, oblong or obovate.*

+– *Flowers whitish or pale pink.*

T. crìspa, Ker. (ÍXIA CRÍSPA, MONTBRÈTIA LACERÀTA.) Stem slender and terete, simple or branched, 6′–12′ high; basal leaves 4–6, linear and very crispy or curled; spikes secund, 4–10-flowered; perianth tube 2′ or less long, funnel-form at the top.

+– +– *Flowers yellow, sometimes blotched.*

++ *Segments obovate, much imbricated.*

T. crocàta, Ker. Stem slender, 12′–18′ high, simple, or branched below; basal leaves 4–6, linear and plane; flowers 4–10 in lax secund spikes; flower bright brown-yellow, the tube rather longer than the spathe.

T. deústa, Ker., differs only in having a purple-black spot on the claws of the 3 outer segments.

T. hyalìna, Baker. Like T. crocata, except that the segments are narrowed into a spatulate base or claw which has an inflexed hyaline margin.

++ ++ *Segments oblong, less imbricated.*

T. Pòttsii, Benth. (MONTBRÈTIA PÒTSII.) Stems 2°–3° high and branched; basal leaves 4–6, linear and plane; spikes lax, 6′–9′ long; flower bright yellow, with a tinge of red, the segments about half or less the length of the broad tube.

MONTBRÈTIA CROCOSMÆFLÒRA is a hybrid of the above and Crocosma aurea.

13. SPARÁXIS. (Greek: *to tear*, referring to the torn spathes.) Cape of Good Hope.

S. grandiflòra, Ker. (S. FIMBRIÀTA, S. LÁCERA, S. LILIÀGO, S. ATROPURPÙREA, and others.) Stem terete and erect, 6′–2° high, simple or branched, with a few linear or lanceolate leaves near the base; flowers yellow or purple (but variable in cultivation), the segments 1′ or more long.

S. trícolor, Ker. (S. VERSÍCOLOR, S. LINEÁTA, and others.) Differs from the last in always having a bright yellow throat and a dark blotch at the base of each segment.

14. GLADÌOLUS, CORN FLAG. (Name a diminutive of the Latin word for *sword*, from the leaves.) A genus of about 130 species, many of which are in cultivation. The commonest garden forms are hybrids, derived from the following, in which the perianth tube is funnel-shaped, and the segments are not distinctly narrowed into claws.

* *Leaves subterete or linear.*

G. trístis, Linn. Leaves 3, subterete, strongly 3–5-ribbed, a foot or two long; stem slender and terete, 1°–2° high; flowers 3–4, yellowish-white, in a loose secund spike, fragrant; flower 2′–3′ long, the tube curved and longer than the oblong and acute falcate segments. Cape of Good Hope. G. CÓNCOLOR is a form with paler flowers, noted as being one of the parents of the garden race, G. COLVÍLLEI (see G. cardinalis).

G. cuspidàtus, Jacq. Leaves 3–4, flat but linear; stems 1°–2° high; flowers white or pale pink with a spade-shaped blotch in the center of the 3 outer segments, 4–8 in a very lax, nearly or quite equilateral spike; perianth tube 2′–3′ long, slightly curved, the segments oblong-lanceolate and wavy. Cape of Good Hope.

* * *Leaves distinctly ensiform.*

+ *Flowers (at least the body-color) yellow.*

G. purpùreo-auràtus, Hook. f. Leaves 3–4, rigid, the lowest about 1° long; stem 2°–4° high; flowers 10–15 in a lax secund spike; flower yellowish, with a large red-brown blotch on the 2 inner segments of the outer series, the tube curved and less than an inch long, the segments obovate and spatulate or clawed. Cape of Good Hope. This, with the hybrid G. Gandavensis, is a parent of the hybrid race known as G. LEMOÌNEI, which has bright yellow and red flowers with brown blotches on the lower segments.

G. psittacìnus, Hook. Leaves about 4, rigid, 1°–2° long; stem 2°–3°; flowers many in a lax secund spike; flower with a yellow ground and coarsely grained with red, the curved tube 2′ or less long, the upper segments obovate and much hooded, the 3 lower reflexed and much smaller. Cape of Good Hope. Parent, with G. cardinalis, of the hybrid class G. GANDAVÉNSIS, to which belong most of the older bright-flowered and late varieties. The upper segment, in these varieties, is usually horizontal and strongly hooded. G. BRENCHLYÉNSIS, of like parentage, is still a popular strain.

+ + *Flowers normally white, at least in ground-color.*

G. oppositiflòrus, Herb. Leaves 3–4, crowded, the lowest 1°–2° long; stem 2°–3° high; flowers often 30–40, in a dense 2-ranked spike; flower white, the tube slender and curved (1½′ or less long), the segments oblong-spatulate and subacute. Cape. Interesting as being a parent, with G. cardinalis, of the hybrids known as G. RAMÒSUS (sometimes called G. FLORIBÚNDUS, but not to be confounded with the species of that name). This hybrid race is little known in this country, as it does not flower well unless the corms are planted in the fall. The plants are tall, with

large, open, bright red flowers marked with dark blotches at the base of the 3 lower segments.

G. blándus, Ait. - Leaves about 4, crowded, broad; stems 1°–2° high; flowers 4–8, in a lax spike; flower white, tinged with red, with a curved tube 1½′ long, the upper segments oblong, and the lower ones oblong-clawed with a reddish blotch. There are white, lilac and pink-flowered varieties. G. PUDIBÚNDUS and G. SPOFFORTHIÀNUS are hybrids of this and G. cardinalis.

+– +– +– Flowers normally in pronounced shades of red or purple.

++ Lower segments with a median white line.

G. Byzantìnus, Miller. Leaves commonly 3, laxly ribbed, about 1° long; stem 1½°–2° high; flowers many in a lax spike which is 6′–9′ long; flower dark purple, the lower 3 segments with a claw as long as the blade, the upper segment slightly imbricated when the flower is fully open, the tube only slightly curved; filaments shorter than the anthers. Eastern Mediterranean region. The hardiest species.

G. commùnis, Linn. Leaves 3–4, laxly nerved, a foot or less long; stem 1½°–2° high; spike lax, secund, 4–8-flowered; flower bright purple, smaller than the last, the tube curved, the segments an inch long and all connivent when the blossom is open, the 3 lower with a long claw; filaments the length of the anthers, or longer. There are white forms. S. Eu. Little planted now.

++ ++ Lower segments white-blotched.

G. cardinàlis, Curt. Leaves glaucous-green, not rigid; stem 2°–3° high; spike 12–20-flowered, in a lax suberect spike; flower bright scarlet, the tube nearly straight and 1½′ long, the upper segments oblong-spatulate and the 3 lower shorter and narrower. Cape of Good Hope. One parent (with G. tristis) of G. COLVÍLLEI, a race with bright scarlet nearly erect flowers and oblong acute segments, the lower 3 having a long blotch of yellow at the base. A white-flowered form of this race is in cultivation (known as the BRIDE). G. cardinalis is also one parent of G. Gandavensis, G. ramosus, and G. pudibundus (see above).

G. Saundérsii, Hook. f. Leaves 4–6, rigid and strongly ribbed; stem 1½°–2° high; spike very lax and 6–8-flowered; flower bright scarlet, with a curved tube 1½′ or less long, the 3 upper segments oblong-spatulate and connivent, the 3 lower narrower and shorter, with a large white blotch and scarlet spots. Cape of Good Hope. The G. NANCEIÀNUS type is a hybrid of this and G. Lemoinei (see G. purpureo-auratus).

CXVII. AMARYLLIDACEÆ, AMARYLLIS FAMILY.

Chiefly perennial and glabrous herbs, with leaves and scape from a bulb, corm, etc., the leaves nerved from the base, and rarely with any distinction of blade and petiole; the perianth regular or but moderately irregular and colored, its tube adherent to the surface of the 3-celled ovary; and 6 stamens with good anthers. Style single. Capsule several– ∞-seeded. Bulbs acrid, some of them poisonous. To this family belong many of the choicer bulbs of house culture, only the commonest here noticed. Flowers often lily-like, but differing in the inferior ovary.

** Scape and linear hairy leaves from a little solid bulb or corm.*

1. HYPOXIS. Perianth 6-parted nearly to the ovary, spreading, greenish outside, yellow within, persistent and withering on the pod.

** * Scape and mostly smooth leaves from a coated bulb, the stem leafless or nearly so.*

+ A cup-shaped, funnel-shaped, or saucer-shaped crown on the throat of the perianth.

2. NARCISSUS. Perianth with a more or less cylindrical tube, 6 equal widely spreading divisions, and stamens of unequal length included in the cup or crown. Scape with one or more flowers, from a scarious 1-leaved spathe.

+ + No true crown in the throat of the perianth, but sometimes represented by scales, or the filaments united by a web-like or crown-like tissue.

++ Anthers erect, not versatile; perianth tube 0; *filaments on the ovary at the base of the 6-parted perianth.*

3. GALANTHUS. Scape with usually a single small flower on a nodding pedicel. Perianth of 6 oblong separate concave pieces; the three inner shorter, less spreading, and notched at the end. Anthers and style pointed.
4. LEUCOIUM. Scape bearing 1–7 flowers on nodding pedicels. Perianth of 6 nearly separate oval divisions, all alike. Anthers blunt. Style thickish upwards.

++ ++ Anthers fixed by the middle and versatile; perianth tube often evident or long; filaments borne on the perianth.

= Perianth tube 0, *or exceedingly short.*

5. SPREKELIA. Scape strong and tall, mostly 1-flowered, the bract one and spathe-like. Flower very showy, with no tube, the upper segments ascending and the lower ones concave. Scales between the filaments small.
6. NERINE. Scape strong, several- or many-flowered, the perianth tube nearly obsolete. Flowers erect or slightly declined, the segments narrow and spreading or recurved. Filaments thickened at the base with no scales between them, prominently protruded. Leaves strap-shaped.

= = Perianth tube evident, often long.

‖ Scape 1*-flowered.*

7. ZEPHYRANTHES. Scape stout but low, the flower arising from a simple bract. Perianth funnel-form, the tube mostly short; segments all similar, spreading. Scales amongst the filaments very small or 0.

‖ ‖ Scape more than 1*-flowered (except rarely in No.* 8).

o Filaments distinct.

× Small scales between the filaments.

8. HIPPEASTRUM. Scape strong and hollow, often tall, the large flowers in an umbel (rarely reduced to 1). Bracts 2, involucrate, distinct. Perianth tube long or short, dilated in the throat and more or less declined, the lobes nearly equal and erect-spreading. Scales often wanting on the lower segments.

× × No scales between the filaments.

9. CRINUM. Perianth with a long slender straight or curved tube and 6 mostly long and narrow spreading or recurved divisions. Stamens long. Scape solid, bearing few or many sessile or short-pediceled flowers, in an umbel. Bulb often columnar and rising as if into a sort of stem. Leaves in several ranks.
10. AMARYLLIS. Perianth various; the divisions oblong or lanceolate, and the tube ribbed, short and declined. Flowers large and fragrant, umbellate and pediceled. Scape solid. Leaves mostly 2-ranked.
11. VALLOTA. Flowers large and showy, short-pediceled and umbellate. Perianth widely flaring above, the tube short and straight, the segments oblong-ovate and connected at the base by a small callus. Involucral bracts 2 or 3. Style declined. Scape strong and hollow.

∘ ∘ *Filaments united by a web-like or cup-like tissue.*

× *Perianth tube much dilated at the throat.*

12. PANCRATIUM. Perianth funnel-shaped, the tube generally long, the segments narrow and erect-spreading. Involucral bracts 2, thin. Cup uniting the filaments bearing teeth or lobes between. Ovules many in each cell. Flowers generally umbellate. Leaves linear or strap-shaped.

× × *Perianth tube cylindrical.*

13. HYMENOCALLIS. Perianth tube long and slender, straight, the lobes narrow or linear and recurved. Involucral bracts 2 or more, scarious. Cup not toothed. Ovules 2 in each cell. Flowers white, fragrant, in an umbel-like cluster. Leaves strap-shaped.

14. EUCHARIS. Perianth tube straight or curved, the segments broad and spreading. Cup entire or toothed between the filaments. Bracts several or many, the 2 or 3 outer ones involucre-like. Ovules 2–∞ in each cell. Flowers white in umbels, showy. Leaves broad, narrowed into distinct petioles.

* * * *Stems leafy, or scape beset with bracts, from a tuberous rootstock or crown.*

+ *Perianth tube* 0.

15. ALSTRŒMERIA. Stems slender and weak or disposed to climb, leafy to the top, the thin lanceolate or linear leaves commonly twisting or turning over. Flowers in a terminal umbel. Perianth 6-parted nearly or quite to the ovary, rather bell-shaped, often irregular as if somewhat 2-lipped. Stamens more or less declined. Style slender; stigma 3-cleft.

+ + *Perianth tube evident.*

16. POLIANTHES. Stem erect and simple from a thick tuber, bearing long-linear channeled leaves, and a spike of white flowers. Perianth with a cylindrical and somewhat funnel-shaped slightly curved tube, and 6 about equal spreading lobes. Stamens included in the tube; anthers erect. The summit of the ovary and pod free from the calyx tube; in this and other respects it approaches the Lily Family.

17. AGAVE. Leaves thick and fleshy with a hard rind and a commonly spiny margin, tufted on the crown, which produces thick fibrous roots, and suckers and offsets; in flowering sends up a bracted scape, bearing a spike or panicle of yellowish flowers. Perianth tubular-funnel-shaped, persistent, with 6 narrow almost equal divisions. Stamens projecting; anthers linear, versatile. Pod containing numerous flat seeds.

1. HYPÓXIS, STAR GRASS. (Greek: *sub-acid*, once applied to some other plant.)

H. erécta, Linn. Common in grass; with few-flowered scape 3′–8′ high, and leaves at length longer; yellow star-like flower over ½′ broad.

2. NARCÍSSUS. (Greek name, that of the young man in mythology who is said to have been changed into this flower.) Popular ornamental bulbous plants, running into many varieties and much confused by hybridization. Following are the chief horticultural types:

* *Crown as long as the divisions of the perianth, or longer.* — DAFFODILS.

+ *Leaves flat, glaucous.*

N. Pseudo-Narcíssus, Linn. DAFFODIL, TRUMPET D. Scape 1-flowered, short; flower large, yellow, with a short and broad tube, and a large bell-shaped cup, having a wavy-toothed or crisped margin; double-flowered forms are common. Eu.

+ + *Leaves linear, subterete, green.*

N. Bulbocòdium, Linn. HOOP PETTICOAT D. Flowers bright yellow; tube and crown about equal in length, the crown expanded and very

indistinctly toothed; segments of the perianth linear and ascending; stamens declined; scape 4′–8′ high, 1-flowered, more or less surpassed by the leaves. S. Eu. and N. Africa.

* * *Crown half to three fourths as long as the perianth divisions.*

+ *Leaves flat, glaucous.*

N. incomparábilis, Curt. Flowers yellow, solitary, 2′–2½′ broad, the tube about 1′ deep and cylindrical, the perianth divisions spreading, oblong-lanceolate; crown plicate and lobed, of a deeper shade than the segments; scape 1° high. Eu.

+ + *Leaves linear and caniculate, green.*

N. odòrus, Linn. Flowers yellow, 2–5 on a scape, only slightly fragrant; tube ½′–¾′ long, open at the throat; segments oblong-lanceolate and acute; crown plaited; scape 1°–1½° high. Variable. Spain.

* * * *Crown less than half the length of the divisions.*

+ *Leaves flat, glaucescent.*

++ *Scape many-flowered.*

N. Tazétta, Linn. (N. polyánthos). Polyanthus N. Leaves glaucous; flowers fragrant, numerous in an umbel, yellow or sometimes white, with the crown golden or orange color. Bulb large (often 2′ thick), the scape 1°–2° high. Runs into many forms. Eu. The Chinese Sacred Lily is var. orientàlis, with a more spreading and crenulate crown.

++ ++ *Scape 1–3-flowered.*

N. bifiòrus, Curt. Primrose Peerless of the old gardeners; flowers white or pale straw-colored, 1–3 on the scape, the crown pure yellow. Thought to be a hybrid between the last and the next.

N. poéticus, Linn. Poet's N. Scape 1-flowered; crown of the snow-white flower edged with pink, hardly at all projecting from the yellowish throat; in full double-flowered varieties the crown disappears. Common in cult. S. Eu.

+ + *Leaves linear and subterete.*

N. Jonquílla, Linn. Jonquil. Flowers 2 to 5, small; yellow, very fragrant; segments spreading horizontally, oblanceolate or obovate-cuspidate; tube slender. There is a double form. S. Eu.

3. GALÁNTHUS, SNOWDROP. (Greek: *milk* and *flower*, probably from the color.) Flowers earliest spring.

G. nivàlis, Linn. Sends up in earliest spring a pair of linear pale leaves and a scape 3′–6′ high, bearing its delicate drooping white flower, the inner divisions tipped with green; a variety is full double.

G. Imperàtri, Bertol. Larger, with very narrow-based outer segments. Italy.

4. LEUCÒIUM, SNOWFLAKE. (Ancient Greek name, meaning *White Violet.*) In gardens from Eu.; much like Snowdrops on a larger scale, flowering later, the scape more leafy at base, and leaves bright green.

L. vérnum, Linn. Scape about 1° high, mostly 1-flowered in spring; pod pear-shaped and 6-sided.

L. æstìvum, Linn. Scape 2° high, bearing 3–7 rather broader flowers in late spring or early summer; pod rounder.

5. SPREKÈLIA. (*J. H. Sprekelsen*, a German botanist of last century, who wrote upon liliaceous plants.)

S. formosíssima, Herb. JACOBEAN or ST. JAMES'S LILY. Cult. from Mexico; scape 2° high, bearing a single large and declined deep crimson-red flower, with hardly any tube, and 2-lipped, as it were, three divisions recurved-spreading upwards, three turned downwards, these at base involute around the lower part of the deflexed stamens and style.

6. NERÌNE. (Name of the water nymph.) Cape of Good Hope.

N. Sarniénsis, Herb. GUERNSEY LILY. Scape 2°–3° high, bearing an umbel of wavy pale salmon-colored flowers, which have the segments recurved; leaves thick, appearing after the flowers. There are crimson-flowered forms.

7. ZEPHYRÁNTHES. (Greek: *wind flower*, a fanciful name.) Generally called AMARÝLLIS in gardens.

Z. Atamásco, Herb. ATAMASCO LILY. Penn., S. in low grounds; scape 6′–12′ high, mostly shorter than the glossy leaves; flower 2′–3′ long, single from a 2-cleft spathe, regular, funnel-form, white and pinkish; stamens and style declined.

Z. cándida, Herb. PERUVIAN SWAMP LILY. Flowers pure white, not fragrant, rising just above the bright green fleshy leaves (scape 6′–12′ high); segments nearly equal, ovate and obtuse, an inch long. S. Amer.

Z.ròsea, Lindl. FAIRY LILY. Flowers larger, rose-colored, regular and erect; segments rotate, sharp-pointed, green below the middle; plant tufted, the leaves striate. Cuba.

8. HIPPEÁSTRUM. (Greek: *knight* and *star*, from some fancied resemblance in the flowers of H. equestre.) Often known in gardens as AMARÝLLIS.

* *Flower clear white, red-striped.*

H. vittàtum, Herb. Peru; double red feathery stripes on each of the segments (which are erose and more or less recurved at the tip); tube trumpet-like, about twice longer than the lobes, greenish. Very handsome.

* * *Flowers red or orange.*

H. aùlicum, Herb. LILY OF THE PALACE. Brazil; flower very large and handsome, the large segments crimson and striate, with a blotch of red-purple and a green base; leaves green and striate; 1°–2° high; tube very short and open, the segments widely spreading.

H. equéstre, Herb. BARBADOS LILY. Mexico; flowers medium large and normally orange-red, but running into light red and striped sorts; stamens strongly curved upwards at their ends; tube slender and curved, becoming dilated, mostly longer than the wavy-cuspidate segments.

H. Reginæ, Herb. Mexico; has 2–4 large, almost regular nodding flowers, crimson-red, with hardly any tube, and the deflexed stamens curved strongly upwards at the end.

H. JOHNSÒNI is a robust hybrid with dull red flowers, each segment with a white stripe. Common.

9. CRÌNUM. (Greek name for a Lily.) Showy conservatory plants, chiefly from tropical regions; one wild S.

* *Flowers red.*

C. amábile, Donn. The huge bulb rising into a column; leaves becoming several feet long and 3′–5′ wide; flowers numerous, 8′–10′ long, crimson-purple outside, paler or white within. Sumatra.

* * *Flowers white.*

C. Asiáticum, Linn. Tropical Asia; slender perianth tube 3′–4′ long, green tinged; flowers about 20 in an umbel, the linear segments 2′–3′ long. Bulb 4′–5′ in diam., with a long neck, the peduncle sharp-edged, 2° high.

C. Americànum, Linn. River swamps Fla., W.; scape 1°–2° high, from a globular bulb; flower white, 6′–7′ long; leaves concave and obtuse, remotely denticulate.

10. AMARÝLLIS. (Dedicated to the nymph of this name.)

A. Belladónna, Linn. Belladonna Lily. Cape of Good Hope; has elongated bulbs, channeled narrow leaves shorter than the solid scape, and several almost regular large rose-red fragrant flowers, funnel-form with very short tube, the stamens not much declined.

11. VALLÒTA. (*Pierre Valot*, an early French botanist.)

V. purpùrea, Herb. (or Amarýllis speciòsa). Cape of Good Hope; the scarlet-red flowers with short funnel-shaped tube, rather longer than the broad-ovate and nearly equal spreading divisions. Popular greenhouse plant, with scape 2°–3° high, the leaves (equaling the scape) lance-linear.

12. PANCRÀTIUM. (Greek: *all potent*, probably in reference to some supposed medicinal qualities.)

P. marítimum, Linn. Sea Daffodil. Glaucous; leaves linear, erect; scape barely flattish; perianth 5′ long, its green tube enlarging at summit into the funnel-shaped 12-toothed cup, to the lower part of which the spreading narrow-lanceolate divisions of the perianth are united. Salt marshes, S. Car., S. (Eu.)

13. HYMENOCÁLLIS. (*Beautiful membrane*, Greek name referring to the cup connecting the filaments.) Several species wild, S. and W.

H. lácera, Salisb. (Pancràtium-rotàtum, or P. Mexicànum). Leaves linear strap-shaped, widely spreading, bright green, 2′ or more wide; scape sharply 2-edged, 2–6-flowered; slender tube of the perianth and its linear widely spreading divisions each about 3′ long, the latter wholly free from the short and broadly open wavy-edged saucer-like cup; bulb bearing runners. Low banks and swamps, N. Car., S.

H. occidentàlis, Kunth. Leaves strap-shaped, glaucous, 1½′ or less broad; scape 3–6-flowered, the bracts narrow and about 2′ long; tube 4′ or less long, the linear white segments nearly the same length; crown about 1′ long, tubular below and broadly funnel-form above, the margin either entire or toothed; bulbs without runners. S. Ill., S.

14. EÙCHARIS. (Greek: *very graceful.*) From S. Amer., in greenhouses.

E. grandiflòra, Planch. & Linden. (E. Amazónica). Scape 2°–4° high, bearing 3–6 white, drooping, large (4′–5′ wide) flowers in an umbel; crown green-tinged; leaves several, the petiole mostly rather larger than the wide, strongly ribbed blade.

15. ALSTRŒMÈRIA. (Named by Linnæus for his friend *Baron Alstroemer.*) Several species of the conservatory, from W. S. Amer., of mixed species.

A. Pelegrìna, Linn. Lily of the Incas, from Peru. Flowers few or solitary at the end of the branches, open, rose-colored or whitish, blotched

with pink and spotted with purple, with some yellow on the inner divisions.

A. pulchélla, Linn. f. (A. PSITTACÌNA). Flowers umbelled, funnel-form in shape, the spatulate divisions more erect and close, red, tipped with green and brown-spotted.

A. versícolor, Ruiz. & Pav. Flowers few, terminating the drooping or spreading branches, yellow spotted with purple.

16. POLIÁNTHES, TUBEROSE. (Name probably from Greek words for *white* and *flower*; therefore not *Polyanthes*. The popular name relates to the tuberous rootstock, therefore not *Tube-rose*, but *Tuber-ose*.)

P. tuberòsa, Linn. The only species originally from Mexico; the tall stem with long several-ranked leaves at base, and shorter and sparser ones towards the many-flowered spike (produced in autumn when planted out); the blossoms very fragrant, white, or slightly tinged with rose, the choicer sorts full-double.

17. AGÀVE, AMERICAN ALOE. (Greek word for *noble*.) Plants flower only after some years, and die after maturing the fruit.

A. Virgínica, Linn. Sterile soil from Md. to Ill., and S.; has lance-oblong denticulate and spiny-tipped leaves 6′–12′ long, and scape bearing a loose simple spike of small flowers, 3°–6° high.

A. Americàna, Linn. The COMMON CENTURY PLANT OF AMERICAN ALOE. With very thick spiny-toothed and spine-pointed leaves, 2°–4° long, pale green, or a variety yellowish-striped, the scape when developed from old plants (said, erroneously, to flower only after 100 years in cool climates) tree-like, bearing an ample panicle. Mexico. (Lessons, Fig. 169.)

CXVIII. DIOSCOREACEÆ, YAM FAMILY.

Twining plants, from tubers or thick rootstocks or roots, having ribbed and netted-veined petioled leaves more or less imitating those of Exogens, and small greenish or whitish regular dicœcious flowers, with the tube of the perianth in the fertile ones adhering to the 3-celled ovary; its 6 divisions regular and parted to near the base or to the ovary. Styles 3, distinct or nearly so. Ovules and seeds 1 or 2 in each cell.

1. DIOSCORÈA, YAM. (Named for *Dioscorides*.) Flowers in axillary panicles or racemes; stamens 6 in the sterile ones, separate. Fertile ones producing a 3-celled, 3-winged pod, when ripe splitting through the wings. Flowers summer. Several species are cult. in the tropics. 2ℓ

D. villòsa, Linn. WILD YAM. Sends up from a knotty rootstock its slender stems, bearing heart-shaped, pointed leaves, either alternate, opposite, or some in fours, 9–11-ribbed, and with prominent cross-veinlets. In thickets, commoner S.; slightly downy, or usually almost smooth, so that the specific name is not a good one.

D. divarícàta, Blanco. (D. BATÀTAS). CHINESE YAM, CINNAMON VINE. Cult. from China and Japan (probably native to the Philippine Is.), for ornament, or for its very deep and long farinaceous roots, — a substitute for potatoes; leaves very smooth, heart-shaped, partly halberd-shaped and opposite, with little bulblets in the axils.

D. bulbifera, Linn. Air Potato. Leaves alternate, cordate-ovate and prominently cuspidate, glabrous, 9-nerved (the two lower ones upon either side united at the base), on stalks longer than the blade; flowers in lax and simple axillary drooping racemes. Somewhat cult. in Gulf States for the large angular edible gray tubers (4′–6′ long), in the axils of the leaves. Tropical Asia.

CXIX. LILIACEÆ, LILY FAMILY.

Large family, known as a whole by its regular symmetrical flowers, with perianth of 6 (in one instance of 4 and another of 8) parts, as many stamens with 2-celled anthers standing in front of the divisions, and a free 3-celled (rarely 2-celled) ovary. Perianth either partly or wholly colored, or greenish, but not glumaceous. Fruit a few–many-seeded dry pod or soft berry. Flowers not from a spathe, except in Allium, etc. Chiefly herbs, with entire leaves; perennials. The chief genera are here presented in an easy arrangement.

I. SMILAX SUBFAMILY. Chiefly woody-stemmed plants, a few herbaceous, climbing or supported by a pair of tendrils on the sides of the petiole, having 3–9-ribbed and netted-veined leaves and small dicœcious flowers in axillary umbels; stigmas mostly 3, long and diverging, sessile; fruit a berry; the anthers are only 1-celled, opening by one longitudinal slit (the division of the cell, if any, corresponding with the slit).

1. SMILAX. Characters of the Subfamily.

II. ASPARAGUS SUBFAMILY. With parallel-veined mostly alternate leaves, branching or simple stems from a rootstock (at least there is no bulb), a single style (if cleft or lobed at all only at the summit), and fruit a few–several-seeded berry. Pedicels very often with a joint in the middle or under the flower. Flower almost always small, and white or greenish, chiefly perfect.

* *Plants with small scales in place of leaves, from the axils of which are produced false leaves, i.e. bodies which by their position are seen to be of the nature of branches, but which imitate and act as leaves. Perianth greenish or whitish, 6-parted, the stamens borne on its base. Berry 3-celled, the cells 2-seeded.*

2. ASPARAGUS. Flowers greenish-yellow, bell-shaped, scattered along the much divided branches; or, in one group, 2 or 3 in the axils, greenish-white; the linear-oblong divisions of the perianth recurved. The so-called leaves ranging from very narrow to lance-ovate Stems often twining.

* * *Herbs with ordinary broad leaves.*

+ *Perianth bell-shaped, of* 6 (4 in No. 7) *separate and similar deciduous divisions; stamens on the receptacle or nearly so.*

++ *Flowers erect, few or several in an umbel on a naked scape.*

3. CLINTONIA. Base of the scape sheathed by the stalks of a few large oval or oblong and ciliate root leaves. Filaments long and slender; anthers linear or oblong. Style long. Ovary 2–3-celled, becoming a blue berry. Rootstocks creeping, like those of Lily of the Valley, which the leaves also resemble.

++ ++ *Flowers single or few, hanging at the end of the leafy spreading branches, or subaxillary.*

4. DISPORUM. Flowers on slender simple stalks, yellowish. Divisions of the perianth lanceolate or linear. Filaments much longer than the linear-oblong blunt anthers. Ovary with a pair of hanging ovules in each of the 3 cells, becoming an ovoid or oblong and pointed red berry. Rootstock short, not creeping; herbage downy.

5. STREPTOPUS. Flowers single or rarely in pairs along the leafy and forking stem, just out of the axils of the ovate clasping leaves; the slender peduncle usually bent in the middle. Divisions of the perianth lanceolate, acute, the three inner ones keeled. Anthers arrow-shaped, on short and flattish filaments. Ovary 3-celled, making a red many-seeded berry.

++ ++ ++ *Flowers in terminal racemes.*

6. SMILACINA. Raceme or cluster of racemes terminating a leaf-bearing stem. Flowers small, white. Perianth 6-parted. Filaments slender; anthers short. Ovary 3-celled, making a berry. Rootstocks mostly creeping.

7. MAIANTHEMUM. Stem low, only 2-leaved. Flower 4-parted, with 4 stamens, 2-celled ovary and 2-lobed stigma.

+ + *Perianth of one piece, more or less deeply lobed, the stamens inserted on the tube.*

++ *Segments* 6; *flowers on a conspicuous scape or a leafy stem.*

8. CONVALLARIA. Flowers nodding in a one-sided raceme, on an angled scape which rises, with the (about) two oblong leaves, from a running rootstock. Perianth short bell-shaped, with 6 recurving lobes. Stamens included. Style stout. Ovary with several ovules, becoming a few-seeded red berry.

9. POLYGONATUM. Flowers nodding in the axils of the leaves along a leafy and recurving simple stem, which rises from a long and thickened rootstock. Perianth greenish, cylindrical, 6-lobed or 6-toothed, bearing the 6 included stamens at or above the middle of the tube. Style slender. Ovary 3-celled with few ovules in each cell, in fruit becoming a globular black or blue few-seeded berry.

++ ++ *Segments* 8; *flowers inconspicuous because borne close to the ground.*

10. ASPIDISTRA. Remarkable because the lurid-purple flowers are borne at the surface of the ground upon 1-flowered scapes. Stamens 8. Stigma broadly pellate, mushroom-like. Leaves with a distinct petiole and ovate-lanceolate limb, all radical.

III. BELLWORT SUBFAMILY. With alternate and broad not grass-like parallel-veined leaves; stem from a rootstock or from fibrous roots, branching and leafy; style one at the base, but 3-cleft or 3-parted. Fruit a pod, few-seeded. Anthers turned rather outwards than inwards. Perianth of 6 almost similar and wholly separate pieces, deciduous. Not acrid nor poisonous. Plants intermediate between the preceding group and the next two.

11. UVULARIA. Stem terete. Flowers solitary, drooping, yellowish; the perianth narrowly bell-shaped and lily-like, the sepals spatulate-lanceolate and acuminate, with a honey-bearing groove or pit at the erect narrowed base. Stamens short, one at the base of each division; anthers linear, much longer than the filaments. Pod truncate, 3-lobed, loculicidal from the top. Seeds thick and roundish. Leaves perfoliate.

12. OAKESIA. Stem angled. Flowers opposite the leaves (by the growth of the stem), the segments not acuminate. Capsule thin, elliptical, acutish at each end, sharply 3-winged and tardily dehiscent. Leaves sessile.

IV. TRILLIUM SUBFAMILY. With netted-veined leaves all in one or two whorls on an otherwise naked stem, which rises from a fleshy rootstock; styles or sessile stigmas 3, separate down to the ovary. Fruit a berry.

13. TRILLIUM. Perianth of 3 green persistent sepals, and 3 colored petals; the latter at length withering away after flowering, but not deciduous. Anthers linear, adnate, on short filaments, looking inwards. Awl-shaped styles or stigmas persistent. Ovary 3–6-angled. Berry purple or red, ovate, many-seeded.

14. MEDEOLA. Perianth of 6 oblong and distinct nearly similar pieces, recurved, deciduous. Anthers oblong, shorter than the slender filaments. Stigmas or styles long and diverging or recurved on the globular ovary, deciduous. Berry dark-purple, few-seeded.

V. MELANTHIUM SUBFAMILY. With alternate and parallel-veined leaves; stem simple, at least up to the panicles; and flowers often polygamous, sometimes dioecious; styles or sessile stigmas 3, separate down to the ovary. Fruit a pod. Anthers almost always turned outwards. Perianth withering or persisting, not deciduous, the 6 parts generally alike. Mostly acrid or poisonous plants, some used in medicine.

* *Perianth with a long tube rising directly from a thin-coated solid bulb or corm; anthers 2-celled. Stemless.*

15. COLCHICUM. Perianth resembling that of a Crocus. Stamens borne on the throat of the long-tubular perianth. Styles very long.

* * *Perianth without an evident tube, of 6 distinct or almost separate divisions.*

+ *Anthers 2-celled, short; flowers in a simple raceme or spike; pod loculicidal.*

++ *Leaves all at the base of the stem, the latter sometimes bracteate.*

16. HELONIAS. Flowers perfect, in a short dense raceme, lilac-purple, turning green in fruit; the divisions spatulate-oblong, spreading. Filaments slender; anthers blue. Pod 3-lobed; cells many-seeded.

17. TOFIELDA. Flowers perfect, in a close raceme or spike, mostly with a small 3-bracted involucre beneath. Perianth white or greenish, the sepals concave, oblong or obovate, 3-nerved. Styles awl-shaped. Capsule 3-angled, the cells many-seeded. Tufted, from creeping rhizomes.

++ ++ *Stems very leafy.*

18. CHAMÆLIRIUM. Flowers dioecious or mostly so. Perianth of 6 small and narrow white pieces. Pod ovoid-oblong, many-seeded. Spike or raceme slender.

19. XEROPHYLLUM. Flowers perfect, in a compact raceme, white; the divisions oval, sessile, widely spreading, naked. Filaments awl-shaped. Pod globular, 3-lobed, with 2 wingless seeds in each cell.

+ + *Anthers kidney-shaped or round heart-shaped, the two cells confluent into one, shield-shape after opening; styles awl-shaped; pod* 3*-horned, septicidal; seeds commonly flat or thin-margined.*

++ *Stem pubescent above, tall and leafy, from a rootstock; leaves generally broader than linear.*

20. MELANTHIUM. Flowers polygamous, in racemes forming an open pyramidal panicle. Perianth cream-colored, turning green or brownish with age, perfectly free from the ovary, its heart-shaped or oblong and partly halberd-shaped widely spreading divisions raised on a claw and marked with a pair of darker spots or glands. Filaments short, adhering to the claws of the perianth, persistent. Seeds several in each cell, broadly winged. Leaves lanceolate or linear, mostly grass-like. Stem roughish-downy above, its base more or less bulbous.
21. VERATRUM. Flowers polygamous, in panicled racemes. Perianth greenish or brownish, its obovate-oblong divisions narrowed at base, free from the ovary, not spotted. Filaments short. Seeds rather numerous, wing-margined. Leaves broad, many-nerved. Base of the leafy stem more or less bulb-like, producing many long white roots.

++ ++ *Stem glabrous and more slender, generally from a bulb; leaves linear.*

22. STENANTHIUM. Flowers polygamous, in panicled racemes on a leafy stem. Perianth white, with spreading and not spotted lanceolate divisions tapering to a narrow point from a broader base, which coheres with the base of the ovary. Stamens very short. Seeds several, wingless. Leaves linear, keeled, grass-like.
23. ZYGADENUS. Flowers perfect or polygamous, in a terminal panicle. Perianth greenish-white, its oblong or ovate widely spreading divisions spotted with a pair of roundish glands or colored spots near the sessile or almost sessile base. Stamens free from and about the length of the perianth. Leaves linear, grass-like; stem and whole plant smooth.
24. AMIANTHIUM. Flowers perfect, mostly in a simple raceme. Perianth white, the oval or obovate spreading divisions without claws or spots. Filaments long and slender. Seeds wingless, 1–4 in each cell. Leaves chiefly from the bulbous base of the scape-like stem, linear, keeled, grass-like.

VI. LILY SUBFAMILY PROPER (including Asphodel Family). Distinguished by the single undivided style (or rarely a sessile stigma), and fruit a loculicidal pod. Perianth with all 6 parts generally corolla-like, and in all the following nearly similar. Leaves parallel-veined or ribbed, sometimes with netted veins also. Stem or scape mostly simple.

* *Bulbous plants (bulbs either tunicate or coated); stem always herbaceous; radical leaves not in large clumps.*

+ *Stem leafy, especially above, the leaves often whorled or crowded; divisions of the perianth with a honey-bearing furrow or spot at or near the base; style long; stigmas or lobes* 3*; pod packed with* 2 *rows of depressed and flat soft-coated seeds in each cell. Flowers large, often several.*

25. LILIUM. Flower bell-shaped or funnel-form with the separate or partly united divisions spreading or recurved above; the honey-bearing groove beginning at their base. Anthers linear, at first erect, at length versatile. Pod oblong. Bulb mostly scaly. (Lessons, Figs. 107–110.)
26. FRITILLARIA. Divisions of the bell-shaped flower distinct, not at all recurving; the honey-bearing spot above their base. Bulb coated or scaly. Flowers always nodding, often spotted.

+ + *Stem 2-leaved or few-leaved at or towards the base, naked above and ordinarily 1-flowered at summit; the six pieces of the bell-shaped perianth separate; stamens on the receptacle or nearly so; anthers erect; seeds many, pale.*

27. TULIPA. Stem 1–2-leaved above the ground, bearing an erect large flower. Divisions of the perianth broad, not recurved nor spreading. Ovary and pod triangular, columnar; stigmas 3, sessile. Seeds nearly as in Lily.
28. CALOCHORTUS. Stem few-leaved, 1–few-flowered. Flowers large and handsome, of various colors, erect or pendulous, the 3 outer divisions small greenish, and sepal-like, but the 3 inner ones very broad and bearded on the inside and usually blotched at the base, all widely spreading. Capsule oblong, 3-angled.
29. ERYTHRONIUM. Scape 2-leaved from the ground, bearing a nodding flower. Divisions of the perianth lanceolate, recurved or spreading above. Ovary and pod obovate; seeds globular. Style long, more or less club-shaped.

+ + + *Scape naked, bearing 1 to several or many flowers; seeds few, globular or angled; leaves linear or nearly so.*

++ *Flowers in umbels (or in Nos. 30 and 31 sometimes solitary or twin).*

30. BRODIÆA. Perianth of various colors, funnel-form or companulate, the lobes erect or somewhat spreading and equaling or exceeding the length of the tube. Stamens 6 or 3, with staminodia between, the filaments very short. Stigma 3-fid or 3-sulcate. Leaves channeled or flat.
31. MILLA. Perianth white, greenish outside, salver-like, the 6 lobes rotate-spreading; tube long-campanulate. Stamens 6, inserted on the tube, exserted, the anthers long and connivent about the style, but the filaments very short. Stigma 3-parted. Leaves very narrow, glaucous, hollow.
32. ALLIUM. Flowers in a simple umbel, from a 1–2-leaved or scarious spathe, the lobes colored; cells of ovary 1–2-seeded, and pod lobed; style persistent, slender; stigma entire. Plants onion-scented.
33. NOTHOSCORDUM. Differs from Allium in the greenish or yellowish-white flowers, several-seeded cells, scarcely-lobed pod, and absence of onion odor.

++ ++ *Flowers in racemes or spikes (subcorymbose in No. 34).*

= *Perianth parted almost or quite to the base.*

34. ORNITHOGALUM. Flowers bracted, white, wheel-shaped. Style 3-sided; stigma 3-angled.
35. SCILLA. Flowers mostly blue, the divisions 1-nerved. Filaments often broadened at the base. Stigma capitate.
36. CAMASSIA. Flowers blue in ours, the divisions 3- or more-nerved. Filaments filiform. Stigma 3-fid.

= = *Perianth with a pronounced tube, the stamens upon the throat.*

37. CHIONODOXA. Flowers small, mostly blue, stalked in a short raceme, the tube shorter than the recurved-spreading acute segments. Filaments all broadly dilated. Style short, the stigmas small or capitate. Cells 4–6-seeded.
38. MUSCARI. Flowers in a dense raceme; the globular or urn-shaped constricted-mouthed perianth nearly 6-toothed.
39. HYACINTHUS. The short-funnel-shaped or bell-shaped perianth 6-cleft, throat open, the lobes spreading.

* * *Plants with tuberous rootstocks or fibrous-rooted crown; stem always herbaceous; radical leaves often forming large clumps by the spread of the rootstock. Scape (in ours) leafless.*

+ *Flowers in a 2-bracted umbel.*

40. AGAPANTHUS. Perianth blue, tubular at base, with 6 widely spreading divisions nearly regular. Pod triangular, many-seeded. Seeds flat, brownish, winged above. Leaves linear, flat.

+ + Flowers paniculate on a somewhat branching scape.

41. HEMEROCALLIS. Perianth yellow, lasting but a day, funnel-form, with short narrow tube closely investing the ovary; the nearly similar divisions more or less spreading. Pod thick, at first fleshy. Seeds few in each cell, roundish, with a hard and brittle black coat. Leaves linear, grassy and soft, keeled.
42. PHORMIUM. Perianth lurid or yellowish, with a short incurved tube, the 3 exterior segments lanceolate and erect, the 3 interior slender and slightly spreading at the tips. Stamens exserted. Ovules numerous in each cell. Capsule 3-angled. Rhizome short, not fleshy. Leaves radical, long-linear-ensiform, stiff and evergreen, strongly keeled. Panicle long, with short secund branches.

+ + + Flowers in a dense spike.

43. KNIPHOFIA. Flowers very many, reflexed in a dense spike on a bracted scape. Perianth tubular, regular, red or yellow, 6-toothed. Stamens and style straight, protruding from the tubular perianth. Filaments of two lengths. Pod many-seeded. Leaves narrow-linear, long and grassy, keeled, crowded at the root.

+ + + + Flowers in racemes, which are mostly simple.

++ Leaves ovate or heart shaped, netted-veined between the ribs, and on long petioles.

44. FUNKIA. Flowers in a raceme, blue or white. Perianth funnel-form, 6-cleft, the lobes hardly spreading, somewhat irregular. Pod oblong, prismatic, many-seeded. Seeds flat, black, with a soft and thin coat, winged at the apex.

++ ++ Leaves narrow, mostly linear.

45. ASPHODELUS. Perianth segments distinct or nearly so, white with a yellowish line in the center. Stamens hypogynous, shorter than the segments, erect or slightly declined, the filaments dilated at the base and covering the ovary. Ovules 2 in each cell. Capsule obscurely 3-angled. Rhizome small, sometimes annual. Leaves linear, strap-shaped or fistulose.
46. SCHŒNOLIRION. Perianth white or yellow, withering-persistent, the segments distinct and 3–5-nerved. Stamens hypogynous, shorter than the segments, the filaments filiform. Ovules 2 in each cell. Capsule short and truncate, 3-angled. Rhizome tuberous. Leaves long-linear.
47. PARADISEA. Perianth funnel-form, the segments distinct and erect-spreading, narrow at the base, the upper portion oblong-spatulate and 3-nerved. Stamens hypogynous and declined, scarcely shorter than the perianth, the filaments filiform. Ovules many in each cell. Capsule ovoid and coriaceous. Rhizome very short.

** * * Stem a woody trunk, either short or tree-like, bearing a crown of sword-shaped, fleshy or thin leaves; no bulb.*

+ Leaves short, very thick and fleshy, 2-ranked, crowded on the very short stem, at the base of the scape.

48. ALOE. Flowers racemed on a slender bracted scape. Perianth tube straight or slightly curved, the segments elongated. Stamens hypogynous, equaling or exceeding the perianth. Seeds many, 3-angled.

+ + Leaves long, often stiff and sharp-edged, mostly many-ranked, either clustered near the ground or borne upon the short trunk.

49. YUCCA. Flowers in an ample terminal compound panicle, large, often polygamous, white or whitish. Perianth of 6 separate oval or oblong acute divisions, not deciduous, the 3 inner broader, longer than the stamens. Stigmas 3, sessile. Pod oblong, many-seeded; the depressed seeds as in Lily.
50. CORDYLINE. Stem woody, often eventually rising several feet high. Leaves mostly at the top of the stem, firm, mostly about lanceolate. Perianth cylindraceous or narrowly bell-form, the tube short. Ovules many in each cell. Fruit fleshy, small and nearly globular, mostly indehiscent. Flowers small in a large panicle.

1. SMÌLAX, GREEN BRIER, CAT BRIER, or CHINA BRIER. (Ancient Greek name.) In thickets and low grounds; flowers small, greenish, in clusters on axillary peduncles, in summer, or several of the Southern prickly ones in spring.

* *Stems herbaceous, never prickly, smooth; leaves thin, mucronate-tipped; ovules and seeds usually a pair in each cell; berries blue-black, with a bloom; plant, or parts of it, sometimes pubescent.*

S. herbàcea, Linn. CARRION FLOWER (the scent of the blossoms justifies the name). Erect and recurving, often without tendrils, or low-climbing, very variable in size, generally smooth; leaves ovate-oblong or roundish and mostly heart-shaped, 7–9-nerved; peduncles sometimes short, generally 3′–4′ or even 6′–8′ long, even much surpassing the leaves, 20–40-flowered. Moist places. Common.

S. tamnifòlia, Michx. Pine barrens, N. J., S.; differs in its heart-shaped and some halberd-shaped only 5-nerved leaves; peduncles rather longer than the petioles, and berry fewer-seeded.

S. ecirrhàta, Watson. Erect, 3° or less high, the upper petioles tendril-bearing or commonly no tendrils, glabrous; lower leaves bract-like, the others thin and 5–7-nerved, broadly ovate-elliptical to roundish, acute, mostly cordate at the base, sometimes verticillate, sparsely pubescent beneath; umbels 10–20-flowered on peduncles about the length of the petioles; berry 3-seeded. Mich. to Minn. and Mo., and S. Car.

* * *Stems woody, often prickly; ovules and seeds only one in each cell; plant glabrous throughout (except the third).*

+– *Leaves often glossy, 5–9-ribbed; stigmas and cells of ovary 3 (except in S. pumila).*

+– *Berries red; peduncles rather short; leaves 5-ribbed; prickles few.*

S. lanceolàta, Linn. Climbs high; leaves evergreen, lance-ovate or lanceolate, acute at both ends; rootstock tuberous; fruit ripening the second year. Va., S. and W.

S. Wálteri, Pursh. Pine barrens, N. J., S.; 6° high; leaves deciduous, ovate or lance-oval, roundish or slightly heart-shaped; peduncles flat; rootstock creeping.

S. pùmila, Walt. Rising only 1°–3° high, not prickly, soft-downy, with ovate or oblong and heart-shaped, 5-ribbed, evergreen leaves, when old smooth above; peduncles twice as long as petioles, densely-flowered; berries ripening the second year. Dry soil, S. Car. to Fla.

+– +– *Berries black, often with a bloom; leaves mostly roundish or somewhat heart-shaped at base; peduncles almost always flat.*

= *Peduncle not longer than the petiole.*

S. rotundifòlia, Linn. COMMON GREEN BRIER. Common in thickets; yellowish-green, often high-climbing; branchlets more or less square, armed with scattered prickles; leaves ovate or round-ovate, thickish, green both sides, 2′–3′ long; peduncles few-flowered.

Var. **quadrangulàris**, Gray, more common W., has 4-angled branchlets.

= = *Peduncle longer than the petiole, but not twice as long.*

S. glaùca, Walt. Mostly S. of N. Y., but less prickly than the preceding, the ovate leaves glaucous beneath, and seldom at all heart-shaped, smooth-edged, and peduncles longer than petiole; branches terete; branchlets obscurely 4-angled.

S. bona-nóx, Linn. Differs from preceding, in the leaves varying from round-heart-shaped to fiddle-shaped and halberd-shaped, green both

sides, pointed, and the edges often sparsely bristly; branches and branchlets angled. S. Mass., S. and W.

= = = *Peduncle 2–4 times as long as the petiole.*

S. híspida, Muhl. Rootstock long; stem high-climbing, below beset with long and dark, bristly prickles; leaves ovate and heart-shaped, green both sides, thin, 4′–5′ long; flat peduncles 1½′–2′ long; flowers larger than in the Common Green Brier. Conn. to Minn., and S.

S. Pseudo-Chìna, Linn. China Brier. Rootstock tuberous; prickles none or rare; leaves ovate and heart-shaped, green both sides, often contracted in the middle, and rough-ciliate, 3′–5′ long; flat peduncles 2′–3′ long. N. J., W. and S.

← ← *Leaves evergreen; stigma, cell of the ovary, and seed only one.*

S. laurifòlia, Linn. Very smooth, high-climbing stem, with some prickles; leaves thick, glossy, varying from ovate to lanceolate, 3-nerved; peduncles not exceeding the petiole and pedicels; berries black. Pine barrens, N. J., S.

2. ASPÁRAGUS. (The ancient Greek name.) Flowers early summer.

A. officinàlis, Linn. Common Asparagus. Cult. from Eu., for its esculent spring shoots, spontaneous about gardens and waste places; tall, bushy-branched, the leaves thread-shaped; berries red.

A. plumòsus, Baker. A S. African plant, much grown by florists for the delicate spray; climbing (or dwarf in var. nànus), the false leaves ¼′ or less long in tufts, disposed in frond-like, slender branches; flowers small and white, stalked, on the tips of the branchlets.

A. medeoloìdes, Thunb. (or Myrsiphýllum asparagoìdes). "Smilax" of the florists; a very smooth, delicate twiner, cult. in conservatories for winter decoration; the bright green so-called leaves (see Lessons, Fig. 167) 1′ or more long, glossy-green both sides, nerved, set edgewise on the branch, but turning so as to present an upper and under face; the small flowers produced in winter, sweet-scented, with reddish anthers; berries greenish. Cape of Good Hope.

3. CLINTÒNIA. (Named for *DeWitt Clinton*, once governor of New York.) Cold moist woods; flowers early summer.

C. boreàlis, Raf. Only N. and along the mountains; flowers 2–7, greenish-yellow, over ½′ long; berry rather many-seeded.

C. umbellàta, Torr. Along the Alleghanies, N. Y., S.; flowers numerous, ¼′ long, white, speckled with green or purplish dots; seeds only 2 in each cell.

4. DÍSPORUM. (Greek: *double-seeded*, from the 2-ovuled cells.)

D. lanuginòsum, Benth. & Hook. Rich woods, the whole length of the Alleghany region to Canada; branches widely spreading; leaves ovate-oblong, pointed, rounded, or slightly heart-shaped at the sessile base; flowers ½′ long, greenish; style with 3 stigmas; flowers late spring.

5. STRÉPTOPUS, TWISTED STALK (which the name denotes in Greek). In cold or wet woods; flowers in late spring and early summer; small, barely ½′ long.

S. amplexifòlius, DC. Stem stout, rough at base, 2°–3° high; leaves strongly clasping, smooth, glaucous beneath; flower whitish, on a long stalk with abrupt bend above the middle; anthers slender-pointed; stigma truncate. N. Eng. to Minn. and O., and S. in the mountains.

S. ròseus, Michx. Stem 1°–2° high; leaves green, finely ciliate, and with the few branches beset with more short and fine bristly hairs; flower rose-purple, on a less bent stalk; anthers 2-horned, stigma 3-cleft. Similar range.

6. SMILACÌNA, FALSE SOLOMON'S SEAL. (Name a diminutive of Smilax, which these plants do not resemble.) Woods or low grounds; white flowers late spring.

* *Flowers in a terminal panicle; stamens exserted.*

S. racemòsa, Desf. FALSE SPIKENARD. 2° high, minutely downy, leafy to the top; the oblong or lance-oval leaves ciliate, pointed at each end; flowers small (sometimes pinkish), crowded in a compound raceme; the divisions of perianth narrow; berries pale red and speckled. Canada, S.

* * *Flowers in a simple small raceme; stamens included.*

S. stellàta, Desf. Moist places, N.; 1°–2° high, smooth, or the 7–12 lance-oblong leaves minutely downy when young; raceme several-flowered; berries blackish.

S. trifòlia, Desf. Cold bogs N.; 3′–6′ high, smooth, with mostly 3 oblong leaves tapering to a sheathing base; raceme loose, few-flowered; berries red.

7. MAIÁNTHEMUM. (Greek: *mayflower.*)

M. Canadénse, Desf. In moist woods and on banks N.; 3′–6′ high; stem bearing 2 (sometimes 3) heart-shaped leaves, and a short raceme of small flowers; berries red. Common.

8. CONVALLÀRIA, LILY OF THE VALLEY. (Name altered from the Latin *Lilium convallium,* of which the English name is a translation.) Flowers late spring.

C. majàlis, Linn. The only true species, cult. everywhere, from Eu., and wild on the higher Alleghanies; its small, sweet-scented, white flowers familiar. (Lessons, Fig. 113.)

9. POLYGONÀTUM, SOLOMON'S SEAL. (Greek: *many-jointed.*) The English name is from the rootstocks, the impression of the seal being the scar left by the death and separation of the stem of a former year; Lessons, Fig. 99.) Stem recurving or turned to one side. Flowers late spring and early summer.

P. biflòrum, Ell. SMALLER S. Wooded banks; 1°–3° high; the ovate-oblong or lance-oblong leaves nearly sessile and glaucous, or minutely whitish-downy beneath; peduncles mostly 2-flowered; filaments roughened, borne above the middle of the tube.

P. gigantèum, Dietr. LARGER S. Alluvial grounds N.; 3°–8° high, smooth; leaves ovate, partly clasping; peduncles 2–8-flowered; filaments smooth and naked, borne on the middle of the tube.

10. ASPIDÍSTRA. (Greek: a small round *shield,* alluding to the shape of the flower.)

A. lùrida, Ker. China; a popular florist's plant, grown for the stiff, evergreen, shining, striate-green (or white-striped), oblong-lanceolate, sharp-pointed leaves, all of which are radical; blade 12′–20′ long, narrowed into a channeled petiole a third its length.

11. UVULÀRIA, BELLWORT. (Name from the Latin *uvula* or palate; from the hanging flowers.) Stems 6′–2° high, naked below, leafy above; flowers spring. All in rich woods.

U. grandiflòra, Smith. The common one from W. N. Eng., W. and S.; with pale, greenish-yellow flower 1½′ long and smooth, or nearly so inside; stamens exceeding the styles; plant not glaucous.

U. perfoliàta, Linn. Smaller, with sharper tips to the anthers, and parts of the barely yellowish perianth granular-roughened inside; stamens shorter than the styles; plant glaucous throughout. N. Eng., W. and S. (Lessons, Fig. 162.)

12. OAKÈSIA. (Named for *William Oakes*, an early New England botanist.)

O. sessilifòlia, Watson. Common, especially N.; 6′–12′ high, with pale, lance-oblong, sessile or somewhat clasping leaves, which taper at each end and are glaucous beneath, and whitish, cream-colored flower ¾′ long; pod stalked.

O. pubérula, Watson. Slightly puberulent; leaves oval and rounded at base, shining, the edges slightly rough; pod not stalked. Va., S.

13. TRÍLLIUM, THREE-LEAVED NIGHTSHADE, WAKE-ROBIN, BIRTHROOT. (Latin: *triplum*, triple, the parts throughout being in threes.) Low stem from a short tuber-like rootstock (Lessons, Figs. 100, 226, 227), bearing a whorl of three green, conspicuously netted-veined, ovate or rhomboidal leaves, and a terminal flower, in spring. All grow in rich or moist woods, or the last in bogs.

* *Flower sessile; petals and sepals narrow, the former spatulate, dull purple.*

T. séssile, Linn. From Penn. to Minn., and S.; leaves sessile, often blotched, ovate, or rhomboidal; petals sessile, rather erect, turning greenish, long-persisting.

T. recurvàtum, Beck. Differs in having the ovate or obovate leaves narrowed at base into a petiole, sepals reflexed, and pointed petals with a narrowed base. O., W. and N.W.

* * *Flower raised on a peduncle; petals withering away soon after flowering.*

+ *Peduncle erect or inclined; leaves rhombic-ovate, sessile by a wedge-shaped base, abruptly taper-pointed; petals flat.*

T. eréctum, Linn. PURPLE T. or BIRTHROOT. Not so large as the next; the petals (varying from dull dark purple to white or pink) ovate, widely spreading, little longer than the sepals, 1′–1½′ long; stigmas stout and spreading or recurved; flowers ill-scented. N. Eng., W. and S.

T. grandiflòrum, Salisb. GREAT-FLOWERED WHITE T. Flowering rather late; handsome, the obovate petals 2′–2½′ long, much larger than the sepals, gradually recurving from an erect base, pure white, in age becoming rose-colored; stigmas very slender and erect, or nearly so. Common N.

+ + *Peduncle recurved from the first under the short-petioled or almost sessile leaves, not longer than the ovary and recurved white petals.*

T. cérnuum, Linn. NODDING T. Leaves rhombic-ovate; petals oblong, ovate, acute, ½′–¾′ long; styles separate. N. Eng., W. and S.

T. stylòsum, Nutt. Upper country N. Car. to Fla.; leaves oblong, tapering to both ends; petals oblong, tinged with rose-color, much longer and broader than the sepals; styles united at base.

+ + + Peduncle nearly erect; leaves rounded at the base and short-petioled.

T. nivàle, Riddell. Dwarf White T. From W. Penn., N. W.; very early-flowering, 2′–4′ high; leaves oval or ovate, obtuse; petals oblong, obtuse, pure white, 1′ long; styles slender.

T. erythrocárpum, Michx. Painted T. Low woods or bogs N.; leaves ovate, taper-pointed; petals lance-ovate, pointed, wavy, white with pink stripes at the base; berry bright red.

14. MEDÈOLA, INDIAN CUCUMBER (from the taste of the tuberous white and horizontal rootstock; the Latin name from *Medèa*, the sorceress). Flowers early summer.

M. Virgínica, Linn. The only species; simple stem, 1°–3° high, cottony when young, bearing near the middle a whorl of 5–9 obovate-lanceolate, thin and veiny, but also parallel-ribbed leaves, and another of 3 (rarely 4 or 5) much smaller ovate ones at the top, around an umbel of a few small recurved-stalked flowers. N. Eng., W. and S.

15. CÓLCHICUM. (The country, *Colchis*, in Asia Minor.) Flowers in autumn; sends up the lanceolate root leaves the next spring. Sparingly cult. from Eu. for ornament.

C. autumnàle, Linn. Common C. Mostly with rose-purple or lilac flowers; leaves 6′–12′ long, lanceolate.

C. variegàtum, Linn. Has shorter and wavy leaves, and perianth variegated with small purple squares, as if tessellated.

16. HELÒNIAS. (Probably from the Greek for *swamp*, in which the species grows.) Flowers spring.

H. bullàta, Linn. Rare and local plant, from N. J. to E. Va., but sometimes cult.; very smooth, the tuberous rootstock producing a tuft of oblong or lance-spatulate, evergreen leaves, from the center of which rises in spring a leafless scape 1°–2° high, bearing the rather handsome flowers.

17. TOFIÈLDIA, FALSE ASPHODEL. (*Tofield* was a Yorkshire botanist of last century.)

** Glabrous; pedicels solitary or in pairs, in a raceme.*

T. glàbra, Nutt. Stem 1°–3° high, 2–3 leaved; raceme 2′–8′ long, the pedicels sometimes in pairs; flowers whitish, small. N. Car., S.

** * Pubescent, at least above; pedicels mostly in 3's.*

T. glutinòsa, Willd. Stem 1½° or less high, that and the pedicels very glutinous with dark glands; leaves broad-linear but short; perianth remaining soft in withering. Me. to Minn., and S. in the mountains, in moist grounds.

T. pùbens, Ait. Taller, roughened with minute glands; leaves narrow and longer; perianth becoming rigid about the capsule. Pine barrens, N. J., S.

18. CHAMÆLÍRIUM, DEVIL'S BIT. (Greek: *Ground Lily*, the genus having been founded upon an undeveloped specimen.) Flowers summer.

C. Carolinànum, Willd. Blazing Star. Low grounds, N. Eng., S. and S. W. Rootstock short and abrupt, sending up a stem 1°–3° high,

bearing flat, lanceolate leaves at base, some shorter ones up the stem, and a wand-like spike or raceme of small bractless flowers, the sterile ones, from the stamens, appearing yellow.

19. XEROPHÝLLUM. (Greek: *arid-leaved*, the narrow leaves being dry and rigid.) Flowers early summer.

X. setifòlium, Michx. Pine barrens, N. J., S.; a striking plant, with the aspect of an Asphodel; simple, stout stem rising 2°–4° high from a thick or bulb-like base, densely beset at base with very long, needle-shaped, rigid, recurving leaves, above with shorter ones, which at length are reduced to bristle-like bracts; the crowded, white flowers showy.

20. MELÁNTHIUM. (Greek: *black flower*, the perianth turning darker, yet not black.) Flowers summer.

* *Sepals bearing a double gland on the claw.*

M. Virgínicum, Linn. Bunch Flower. Moist grounds, N. Eng., S. and W.; 3°–5° high; lowest leaves sometimes 1′ wide, the upper few and small; flowers rather large; the sepals flat, ovate to oblong or slightly hastate; seed 10 in each cell.

M. latifòlium, Desr. Leaves twice broader, rather oblanceolate; sepals undulate; the claw very narrow; seeds 4–8 in each cell. Conn., S.

* * *Sepals glandless, oblanceolate.*

M. parviflòrum, Watson. Alleghanies, Va., S.; stem 2°–5°, naked above; leaves oval to oblanceolate; seeds 4–6 in each cell; flowers greenish.

21. VERÀTRUM, FALSE HELLEBORE. (Old name, from Latin *vereater*, truly black.) Mostly pubescent, stout herbs; the roots yield the acrid poisonous *veratrin*. Flowers summer.

V. víride, Ait. American White Hellebore, or Indian Poke. Low grounds, mostly N.; stout stem 2°–4° high, thickly beset with the broadly oval or ovate strongly plaited, sheath-clasping leaves; panicle of spike-like racemes pyramidal; flowers yellowish-green, turning greener with age.

22. STENÁNTHIUM. (Name Greek: *narrow flower.*) Flowers summer.

S. angustifòlium, Gray. Alleghanies, Va., S.; 2°–4° high, very slender; the leaves long and narrow ($\frac{1}{4}$′ or less broad); flowers white, only $\frac{1}{4}$′ long, in a prolonged terminal and many shorter lateral racemes, making an ample, light panicle; pod strongly reflexed, with spreading beaks.

S. robústum, Watson. Stem stout and leafy (3°–5° high); the leaves $\frac{3}{4}$′ or less broad; panicle sometimes 2° long; sepals white or green, $\frac{1}{4}$′ long; pod erect, with recurved beaks. Penn., S.

23. ZYGADÈNUS. (Name in Greek means *yoked glands.*) Flowers summer.

Z. glabérrimus, Michx. Pine barren bogs, Va., S.; 1°–3° high, from a running rootstock; leaves rather rigid, keeled, nerved, taper-pointed; panicle many-flowered; divisions of perianth $\frac{1}{2}$′ long, a pair of round spots above the narrowed base.

Z. élegans, Pursh. Bogs in the Northern States; 1°–3° high, from a bulb; leaves flat, pale; flowers rather few; base of perianth coherent with that of the ovary, the divisions marked with an inversely heart-shaped spot.

Z. angustifòlius, Watson. Pine barrens, N. Car., S.; stem hardly bulbous at base, 2′ high; leaves narrow, acute, pale; seeds linear, not fleshy; perianth free from the ovary.

24. AMIÁNTHIUM, FLY POISON. (Name, from the Greek, alludes to the flowers destitute of the spots or glands of Melanthium and Zygadenus.) Flowers summer, turning greenish or purplish with age.

A. muscætóxicum, Gray. BROAD-LEAVED F. Open woods from N. J., S.; with a rather large bulb at the base of the stem, bearing many broadly linear (½′–1′ wide) blunt leaves; raceme dense; flowers rather large; seeds few, red, and fleshy.

25. LÍLIUM, LILY. (The classical Latin name, from the Greek.) The following are the commonest types, wild and cultivated. (Lessons, Figs. 107, 108, 109, 110, 309.)

* *Perianth funnel-form, the segments oblanceolate; leaves linear or lanceolate, sessile, or nearly so; flowers chiefly white in ours.*

← *Leaves scattered.*

L. longiflòrum, Thunb. LONG-FLOWERED WHITE L. Japan and China; 1°–3° high, with lanceolate leaves, and a single horizontal funnel-form flower, 5′ or 6′ long, the narrow tubular portion longer than the rather widely spreading portion; leaves shining-green, 5-nerved, linear to lanceolate. Var. EXÍMIUM (L. HARRÍSII of florists), EASTER LILY, is a rather more showy form used for forcing.

L. Japónicum, Thunb. (L. ODÒRUM). JAPAN WHITE L. Cult. from Japan; 2° high, with mostly only one flower, which is nodding and larger than in the foregoing, below connivent into a narrower tube, and above with the divisions more widely spreading; leaves dark green, longer and broader (often ¾′ wide) than the last. L. BRÓWNII is a taller form with larger flowers, more leaves, the flowers often 3 or 4 together, and purple on the outside.

L. cándidum, Linn. COMMON WHITE LILY. From S. Eu. to Persia; with lanceolate leaves, and few or many, small (2′–3′ long), bell-shaped flowers, smooth inside, sometimes double; stem 2°–3°, with many spreading, mostly linear leaves. Flowers sometimes colored outside.

← ← *Leaves more or less verticillate.*

L. Washingtoniànum, Kellogg. Stem 3°–5° high, with many oblanceolate leaves; flowers horizontal or nearly so, white but becoming purplish, very fragrant, 2′–4′ long, in racemes 1° long; segments not recurved. Ore. and Cal.

* * *Perianth open-funnel-shaped, nodding, the segments widest below the middle and widely spreading; leaves sessile or short-stalked; flowers speckled or spotted in ours.*

← *Leaves sessile.*

L. tigrìnum, Ker. TIGER BULBLET-BEARING L. Stem 4°–5° high, cottony; leaves lanceolate, scattered, with bulblets in the axils; flowers mostly nodding, panicled, numerous, very showy, orange-red, the divisions about 4′ long, black-spotted inside, the divisions without claws, rolled back. China and Japan. (Lessons, Fig. 110.)

+ + *Leaves short-stalked.*

L. speciòsum, Thunb. Stem 1°–3° high; leaves scattered, lance-ovate or oblong, pointed, slightly petioled; flowers few, odorous, the strongly revolute divisions about 5′ long, white or pale rose-color, with prominent purple warty projections inside; now of many varieties. Japan.

L. aurātum, Lindl. Golden-banded L. Japan; stem 1°–2° high; leaves lanceolate, scattered; flowers 1–3, barely nodding, sweet-scented, very large, the ovate-lanceolate divisions 6′ or more long, spreading almost from the base and the tips revolute, white, with a light yellow band down the middle of the upper face, which is spotted all over with prominent purple spots and rough with bristly projections near the base; one of the most showy species, in many forms.

* * * *Perianth open and erect, the segments falcate-expanded (rarely somewhat revolute); flowers orange or scarlet.*

+ *Leaves mostly verticillate.*

L. Philadélphicum, Linn. Wild Orange-Red Lily. Dry land, N. Eng., W. and S.; 1°–2° high, with lanceolate or lance-linear leaves nearly all in whorls of 5–8, and 1–3 open-bell-shaped, reddish-orange flowers 2½′–3′ long, spotted inside with dark purple, the divisions widely separate and on slender claws.

+ + *Leaves few or scattered.*

++ *Stem slender, terete, and glabrous.*

L. Catesbæi, Walt. Southern Red L. 1°–2° high, with scattered, linear-lanceolate leaves, a solitary and large, nearly scarlet flower; the oblong-lanceolate divisions wavy-margined, recurving above, 3′–4′ long, with very slender claws, crimson-spotted on a yellow ground within. Pine barrens, N. Car. and Mo., S.

++ ++ *Stem stouter, furrowed, mostly loosely cobwebby.*

L. bulbíferum, Linn. Bulblet-bearing L. Cult. in old gardens, from Eu.; 1½°–3° high, producing bulblets in the axils of the lanceolate irregularly scattered leaves, and few reddish-orange flowers, the divisions 2′–2½′ long, with some rough brownish projections inside at base, but hardly spotted, without claws, conniving at the broad base, the upper part spreading.

L. cròceum, Chaix. Stem 3°–6°, purple-spotted above, the 3–5-nerved leaves linear and squarose; flowers (in cult. forms) several in a deltoid-umbellate raceme, the segments 2′–3′ long, exterior ones oblong-lanceolate with a spatulate base, interior ones ovate-lanceolate with a distinctly clawed base, all of a beautiful golden color and scarlet-tinted. Eu. Once common in gardens.

L. élegans, Thunb. A Japanese Lily, now much cultivated under a variety of forms and names; stem often only 1° high, with broad (1′ wide) leaves 5–7-nerved, lanceolate; flowers 1–4 and terminal, expanding to 5′ or 6′ across, the oblong-spatulate, obtuse segments 3′–4′ long, all (in the type) pale scarlet, red, and not spotted.

* * * * *Perianth very open or spreading, erect, with strongly reflexed segments; flowers mostly in colors.*

+ *Leaves verticillate.*

++ *Bulbs producing rhizomes.*

L. Canadénse, Linn. Canada L. Rhizomes slender; stem 2°–5° high, bearing few or several long-peduncled flowers; leaves lanceolate, all in remote whorls, their edges and nerves minutely rough; divisions

of the flower 2′–3′ long, recurved-spreading above the middle; capsule top-shaped and obtuse; moist meadows; the commonest wild Lily N.

L. supérbum, Linn. American Turk's-cap L. Stem 3′–7′ high, bearing few or many flowers in a pyramidal panicle; leaves lanceolate, smooth, lower ones whorled, scattered; divisions of the flower strongly rolled backwards, about 3′ long.

Var. **Carolinìanum**, Chapm. In the low country S; 2°–3° high, with broader leaves and only 1–3 flowers more variegated with yellow.

L. pardalìnum, Kellogg. Rhizomes thick and branching; leaves flat and smooth, narrowly lanceolate to linear, the middle ones in whorls of 9–15; flowers 3–6 in a corymb or lax umbel, bright orange-red and lighter yellow in the center, 2′–3′ long, the segments strongly revolute; capsule oblong and acutish. Central Cal., N.; cult. in various forms.

++ ++ *Bulbs not rhizomatous.*

L. Humbòldtii, Roezl. & Leicht. Cal.; a handsome species 4°–5° high, with red-spotted stems; leaves in a few 10–15-leaved whorls, oblanceolate, undulate and somewhat scabrous; flowers several or many in a deltoid panicle, 3′–4′ long, reddish-orange, the acute segments strongly revolute and the outer ones narrowed abruptly into a short broad claw.

L. Mártagon, Linn. Turk's-cap or Martagon L. Eu.; 3°–5° high, with lance-oblong leaves in whorls, their edges rough, and a panicle of rather small but showy, light violet-purple or flesh-color (rarely white) flowers, dotted with small, brown-purple spots.

+– +– *Leaves few or scattered.*

++ *Lanceolate many-nerved leaves.*

L. monadélphum, M. Bieb. Variable species from the Caucasus and Persia; 3°–5° high, stout; leaves ciliate, ascending; flowers bright pale yellow, with light red at the base, 2′–4′ long, 20–30 of them in a tall pyramidal cluster. Grown also as L. Cólchicum and L. Szovítsianum.

++ ++ *Narrow-linear* 1- *or few-nerved leaves.*

L. testàceum, Lindl. Unknown wild, and probably a hybrid of L. candidum and L. Chalcedonicum; stem 4°–5° high, furrowed, lightly brown-puberulent; leaves many, ascending, obscurely 3–5-nerved, the margins often whitish-puberulent; flowers yellow tinged with dull red, 2′–3′ long, 3–10 of them in a thyrsoid raceme, the broad (¾′–1′) segments minutely red-punctate near the base and strongly revolute.

L. Pompònium, Linn. Turban L. Eu.; slender, with scattered and crowded lance-linear or lance-awl-shaped leaves, and several small orange-red or scarlet (rarely white) flowers, their lanceolate acute divisions somewhat bearded inside. This and the next small-flowered, and not common in gardens.

L. Chalcedónicum, Linn. Red L. Stem thickly beset with scattered, narrow, lance-linear, erect leaves, their margins rough-pubescent; flowers several, scarlet or vermilion, the narrow divisions bearded towards the base within, not spotted. Southeastern Eu.

26. FRÍTILLÀRIA. (Latin: *fritillus*, a dice-box, from the shape of the flower, which differs from a Lily in its more cup-shaped outline, the divisions not spreading.) Flowers spring.

F. Meleàgris, Linn. Guinea-hen Flower. Cult. from Eu.; 1° high, with linear alternate leaves, mostly solitary terminal flower purplish, tessellated with blue and purple or whitish; the honey-bearing spot narrow.

F. imperiàlis, Linn. Crown-imperial. Cult. from Asia; a stately herb of early spring, 3°–4° high, rather thickly beset along the middle

with lanceolate or lance-oblong, bright green leaves, more or less in whorls; flowers several, hanging in a sort of umbel under the terminal crown or tuft of leaves, large, orange-yellow, or sometimes almost crimson, a round pearly gland on the base of each division; pod 6-angled.

27. TÙLIPA, TULIP. (Name from the Turkish word for *turban*, which the flower sometimes resembles.) Flowers spring and early summer; much mixed in cultivation. Following are the chief types.

* *Flower white, funnel-form or narrow-campanulate; leaves linear; bulb pilose.*

T. Clusiàna, Vent. LADY TULIP. Slender species, 12′–18′ high, with four or five long-linear and channeled leaves; flower delicate white, red-tinged on the outside, and a black-purple base, the narrow segments bluntish; filaments and anthers black. Mediterranean region.

* * *Flower mostly in shades of red or yellow, bell-form; leaves broad; bulb nearly or quite glabrous.*

+ *Perianth segments all acuminate.*

T. suavèolens, Roth. DUC VAN THOL T. An early-flowering Tulip of dwarf habit, from the Caspian region; perianth large, with the six oblong segments all alike, fragrant, in shades of red and yellow; peduncle downy; leaves few, very broad.

T. acuminàta, Vahl. TURKISH T. Flower variable in color, mostly red, 3′–4′ long, the segments very long-acuminate-pointed; peduncle glabrous; leaves 3–6, broad. Native country unknown.

T. ÉLEGANS is a garden form (probably hybrid of T. suaveolens and T. Gesneriana, with a minutely downy peduncle, campanulate perianth 3′–4′ long, which is bright red with a yellow eye, the segments acute-pointed.

T. RETROFLÉXA, an evident hybrid of T. acuminata and T. Gesneriana, has bright yellow flowers, about 3′ long, the oblong segments gradually narrowed to a point; stamens yellow.

+ + *Perianth segments all very obtuse, with a small cusp in the center.*

T. Gesneriàna, Linn. COMMON T. Parent of most of the common late-flowering sorts, from Asia Minor; leaves 3–6 and broad; peduncle glabrous; flower large, very variable in color. T. FÚLGENS is a form with bright red flowers with a yellow eye. The PARROT TULIPS, with long, loose and fringed segments, are var. DRACÓNTIA.

28. CALOCHÓRTUS, MARIPOSA LILY. (Greek: *beautiful grass.*) Californian plants of many species, some now becoming frequent in cultivation. Glands at the base of the perianth.

* *Inner perianth segments strongly arched and pitted, the glands with a transverse scale or fringe.*

C. álbus, Dougl. Stem 1°–3°, branching, the nodding flowers white, with a purplish base; inner segments acute, 1′ long, bearded and ciliate.

C. pulchéllus, Dougl. Stem 1°–2° high, branching, the nodding flower yellow or orange; inner segments bearded and ciliate, deeply pitted.

* * *Flowers open-campanulate (segments not arched), the glands densely hairy but without scales.*

C. lùteus, Dougl. Stem bulbiferous at the base, 1–6-flowered; leaves narrow; outer segments narrow-lanceolate, yellow with a brown spot; inner segments yellow or orange, lined with brownish purple. Variable.

C. venùstus, Benth. Differs in having white or pale lilac inner segments with a reddish spot at the top, a brownish yellow-bordered center, and a brownish base.

29. ERYTHRÒNIUM, DOGTOOTH VIOLET. (Name from the Greek word for *red.*) Flowers spring.

E. Americànum, Ker. YELLOW D. or ADDER'S TONGUE. Moist or low woods, very common E.; leaves oblong-lanceolate, mottled and dotted with dark-purplish and whitish; flower light yellow.

E. álbidum, Nutt. WHITE D. N. J., W.; leaves less or not at all spotted; flower bluish-white.

30. BRODIÆA. (*J. J. Brodie,* a botanist of Scotland.) Several species upon the Pacific coast, several of them occasionally cultivated, but only the following species, from S. Amer., is common in gardens.

B. uniflòra. (TRITELEÌA, or MÍLLA, UNIFLÒRA). STAR FLOWER. Scape 4′–14′ high, 1-flowered (very rarely 2-flowered), with a sheathing spathe below the flower, the latter pale violet or almost white with a purple stripe in the center of each oblong blunt-pointed segment, 1′–1½′ long; leaves several, flat and grass-like, striate, glaucous, as long as the scape. Often confounded with the next.

31. MÍLLA. (*J. Milla,* a Spanish gardener.)

M. biflòra, Cav. Scape smooth, 4′–12′ high, bearing 1–5 nearly equal pedicels 3′–6′ long; perianth 1½′–2′ long, snow-white inside but greenish outside; leaves nearly terete and rough. Mexico.

32. ÁLLIUM, ONION, LEEK, GARLIC, etc. (Ancient Latin name.) Taste and odor *alliaceous.*

* *Leaves broad and flat; flowers white, in summer.*

A. tricóccum, Ait. WILD LEEK. Rich woods N.; bulbs clustered, large, pointed, sending up in spring 2 or 3 large, lance-oblong, flat leaves, and after they wither, in summer, a many-flowered umbel on a naked scape.

A. Mòly, Linn. GOLDEN GARLIC. Cult. for ornament in some gardens; leaves broadly lanceolate; scape 1° high; flowers numerous, large, golden yellow.

* * *Leaves linear, grass-like, or awl-like, not hollow.*

+ *Umbel nodding.*

A. cérnuum, Roth. Banks, through the Alleghany region and N. W.; scape angular, 1°–2° long, often nodding at the apex; pedicels of the loose, many-flowered umbel drooping; flowers light rose-color; leaves linear, sharply keeled on the back, channeled.

+ + *Umbel erect.*

A. mutábile, Michx. Dry sandy soil N. Car., S.; scape 1° high, terete, bearing an umbel of white flowers changing to rose-color; leaves narrow, concave; bulb coated with a fibrous network.

A. satìvum, Linn. GARDEN GARLIC. Bulbs clustered, pointed; leaves lance-linear, keeled; flowers few, purple, or bulblets in their place; filaments all broad and 3-cleft. Eu.

A. Pórrum, Linn. GARDEN LEEK. Bulb elongated, single; leaves broadly linear, keeled or folded; flowers in a head, white, with some rose-colored stripes; 3 of the filaments 3-forked. Eu.

* * * *Leaves terete and hollow.*

+ *Bulbs cespitose, crowning a rhizome; the plant, therefore, tufted.*

A. Schœnóprasum, Linn. CHIVES. Low, in mats; leaves awl-shaped, equaling the scape; flowers purple-rose-color, its divisions lanceolate and

pointed, long; filaments simple. Cult. for flavoring, and also wild on our northern borders.

+ + *Bulbs distinct, the plant not tufted.*

A. vineàle, Linn. Field or Crow Garlic. A weed from Eu. in gardens and waste low grounds; slender scape sheathed to the middle by the hollow thread-shaped leaves, which are grooved down the upper side; flowers greenish-rose-color; often their place is occupied by bulblets.

A. Ascalónicum, Linn. Shallot. Bulb with oblong offsets; leaves awl-shaped; flowers lilac-purple; 3 of the filaments 3-forked. Old World.

A. Cèpa, Linn. Onion. Bulb depressed, large, sometimes making offsets; leaves much shorter than the hollow, inflated scape; flowers white, or bulblets in their place. Persia.

A. fistulòsum, Linn. Welsh Onion, Ciboule. Differs from the last in forming no distinct bulb, the numerous glaucous leaves somewhat clustered. The leaves are used for soups and flavoring. Siberia.

33. **NOTHÓSCORDUM.** (Greek: *false garlic.*)

N. striàtum, Kunth. Low pine barrens and prairies, Va. to Ill., and S.; scape and leaves 6′–12′ high, the latter involute and striate on the back; flowers 3–10 in the umbel; ovules and seeds several in each cell; flowers nearly white, in spring.

34. **ORNITHÓGALUM**, STAR-OF-BETHLEHEM. (Name in Greek means *bird's-milk*, a current expression for some marvelous thing.) Flowers early summer.

* *Flowers nodding in a loose unilateral raceme.*

O. nùtans, Linn. Scape 8′–16′ high; flowers 5 or 6, 1′ long, on very short pedicels, white with green on the under side. Cult., and sparingly escaped E. S. Eu.

* * *Flowers erect in racemes or corymbs.*

O. umbellàtum, Linn. Common S. or Ten-o'clock. From Eu.; in old gardens and escaped into some low meadows; leaves long and grass-like; flowers bright white within, green outside, opening in the sun, on slender stalks.

O. Arábicum, Linn. Mediterranean region, now frequent in greenhouses; scape stout, 1°–2°, with a 6–12-flowered, rounded or deltoid raceme; leaves flat, 1′ or less broad; flowers large, white, with a black center, odorous.

O. caudàtum, Ait. Sea Onion. Scape terete and often 3′ high, with 30–100 small, greenish-white flowers in a long raceme; leaves few, fleshy, flat, strap-shaped and long-pointed. Cape of Good Hope. Conservatories and window gardens.

35. **SCÍLLA**, SQUILL. (The ancient name.) Several species are in cultivation; the commonest is

S. Sibírica, Andr. Scapes several from each bulb, 3′–8′ high, 2 to 3-flowered in earliest spring; leaves 2 to 4, narrow-strap-shaped and finely striate; flowers deep blue, ¾′ or less long, often slightly drooping, on short stalks, the acute segments widely spreading. Russia and Siberia.

36. **CAMÁSSIA**, CAMASS. (From the Indian name.)

C. Fràseri, Torr. Wild Hyacinth, Quamash. Moist banks and prairies from W. Penn., W. and S. W.; scape and linear-keeled leaves 1° high; flowers pale blue, in a long loose raceme, in spring.

37. CHIONODÓXA. (Greek: *glory of the show*, referring to the early flowering.)

C. Lucíliæ, Boiss. A pretty little bulbous plant from Asia Minor: scape 6′ high, bearing a raceme of 3 to 6, and sometimes more, flowers which are deep blue shading to white in the center (a variety is white-flowered), the acute segments widely spreading or even recurved, and expanding to nearly 1′ across; leaves narrow.

38. MUSCÀRI, GRAPE or GLOBE HYACINTH. (Name from the musky scent of the flowers in one species.) Flowers spring.

M. botryoìdes, Mill. COMMON GRAPE HYACINTH of country gardens, escaping into lawns and fields; a pretty little plant, sending up in early spring its narrow linear leaves, and a scape (5′–7′ high) bearing a dense raceme of globular deep blue flowers which are barely $\frac{1}{6}$′ long, resembling minute grapes, scentless. Eu.

M. moschàtum, Willd. MUSK HYACINTH. Glaucous, with larger and ovoid-oblong, livid, musky-scented flowers, and linear-lanceolate shorter leaves. Asia Minor.

M. comòsum, Mill. Larger, 9′ high, with violet-colored oblong flowers, on longer pedicels in a loose raceme, the uppermost in a tuft and abortive; the monstrous variety most cultivated produces, later in the season, from the tufted apex of the scape a large panicled mass of abortive, contorted, bright blue branchlets, of a striking and handsome appearance. S. Eu.

39. HYACÍNTHUS, HYACINTH. (Mythological name.) The so-called H. CÁNDICANS, of gardens, a plant 4°–6° high and bearing 20 to 100 bell-shaped, creamy flowers, is GALTÒNIA CÁNDICANS, Decne., of S. Africa.

H. orientàlis, Linn. COMMON H. Of the Levant, with its raceme of blue flowers, is the parent of numberless cultivated varieties, of divers colors, single, and double; tube of the perianth more or less ventricose, the segments oblong-spatulate. Flowers spring.

Var. ***álbulus***, Baker, of S. France, is the parent of the ROMAN HYACINTHS. It is slenderer, with more erect leaves, flowers small and white, and the tube scarcely ventricose, bearing oblong segments.

40. AGAPÁNTHUS. (Of Greek words for *amiable flower*.) One species.

A. umbellàtus, L'Her. A handsome house plant, turned out blooms in summer; leaves large, bright-green (a variegated variety), 1°–2° long; scape 1½°–2° high, bearing an umbel of pretty large blue flowers. There are many garden forms, varying chiefly in color of flowers (some white) and size of plant. Cape of Good Hope.

41. HEMEROCÁLLIS, DAY LILY. (Name, in Greek, means *beauty of a day*, the large flower ephemeral.) Cult. from the Old World, especially in country gardens; the first species escaped into roadsides; flowers summer.

H. fúlva, Linn. COMMON DAY LILY. A familiar, rather coarse and tall plant, with broadish linear leaves and tawny orange flower, the inner divisions wavy and obtuse.

H. flàva, Linn. YELLOW D. Less coarse, with narrower leaves and clear light yellow, fragrant flowers, the inner divisions acute. Less common than the other, but handsomer.

42. PHÓRMIUM, NEW ZEALAND FLAX. (Greek: *basket*, from the use made of the fiber.)

P. tènax, Linn. Nearly hardy N., but does not flower; the very firm, finely nerved, linear, evergreen leaves (a variegated variety) tufted on matted rootstocks, strongly keeled, conduplicate below, nearly flat above, yielding a very strong fiber for cordage. New Zealand.

43. KNIPHÒFIA. (*Johann H. Kniphof*, a German physician of the last century.) Flowers unpleasantly scented, showy, in autumn.

K. aloïdes, Moench. (or TRITÒMA UVÀRIA). RED-HOT POKER PLANT, or FLAME FLOWER. Ornamental in autumn, the scape rising from the thick clumps of long grassy leaves 3° or 4° high, the cylindrical spike or raceme producing a long succession of flowers, which are at first erect and coral-red; soon they hang over and change to orange and at length to greenish yellow. Roots half hardy N. Cape of Good Hope.

44. FÚNKIA. (Named for *H. Funck*, a German botanist.) Ornamental, hardy plants with large cordate-ovate ribbed leaves in clumps, cult. from Japan and China; flowers summer.

F. subcordàta, Spreng. WHITE DAY LILY. The species with long, white, and tubular-funnel-form flowers.

F. ovàta, Spreng. BLUE D. (F. CŒRÙLEA). With smaller, more nodding, blue or violet flowers, abruptly expanded above the narrow tube.

45. ASPHÓDELUS, ASPHODEL. (Ancient name.) The A. LÙTEUS of gardens is ASPHODELÌNE LÙTEA, Reichb., from Eu., distinguished from the true asphodels chiefly by the leafy stem and yellow flowers. The ones seen in gardens are:

A. fistulòsus, Linn. Leaves hollow, striate and awl-like; stem 16′–20′ high. Eu.

A. álbus, Willd. Leaves linear and keeled; peduncles clustered. Eu.

46. SCHŒNOLÍRION. (Greek: *rush lily*.) We have two species in Georgia and Florida.

S. cròceum, Gray. Stem 1° high, very slender; raceme 1′–4′ long, simple; bracts ovate and somewhat obtuse, purple; flowers yellow tinged with red, the segments narrow.

S. Ellióttii, Feay. Stouter, 2° high; racemes mostly panicled, each becoming 2′–4′ long; bracts ovate or acuminate; flowers white, the segments oval and 5-nerved.

47. PARADÍSEA. (*Paradise*, of which this very ordinary plant is supposed to be a fit inhabitant.) The genus ANTHÉRICUM (including PHALÁNGIUM) differs from this in its rotate perianth, 4–8-ovuled cells, often angular pod, and the anthers attached between their basal lobes (in Paradisea, attached on the back). There are two or three species sometimes found in gardens, chiefly the European A. LILIÀGO, Linn., with stem sparingly branched, large white flowers (1′–1½′ across) and curved style; and A. RAMÒSUM, Linn., with more branching stems, smaller flowers and a straight style.

P. Liliástrum, Bertol. ST. BRUNO'S LILY. Stems or scapes simple, 1°–2° high, bearing 10–20 white, bell-like, fragrant flowers, nearly or quite

2′ long; segments with a greenish spot on the point; leaves narrow and flat, all radical. S. Eu.; the only species.

48. ALÒE. (Name from the Arabic.) A large and difficult genus of succulent mostly S. African plants. Probably the commonest is

A. variegàta, Linn. Leaves ascending and lanceolate, 4′–5′ long, concave above and keeled below, denticulate, green spotted with gray and margined with white; flowers 1½′ long, reddish, in a simple loose raceme 3′–4′ long; scape 1° or less high.

49. YÚCCA, BEAR GRASS, SPANISH BAYONET. (American aboriginal name.) Cult. for ornament, but only the nearly stemless species is really hardy N. Flowers summer, large; and whole plant of striking appearance. The common ones, under various names and varieties, mainly belong to the following:

* *Trunk short, covered with leaves, rising only a foot or two above the ground; flowering stalk scape-like; pod dry.*

Y. filamentòsa, Pursh. COMMON BEAR GRASS, or ADAM'S NEEDLE. From Md. S.; leaves lanceolate, 1°–2° long, spreading, moderately rigid, tipped with a weak prickly point, the smooth edges bearing thread-like filaments; scape 3°–6° high; flowers white or pale cream-color, sometimes tinged purplish.

Y. angustifòlia, Pursh. Smaller, with erect and narrow linear leaves, few threads on their white margins, and yellowish-white flowers. S. Dak., S.

* * *Trunk arborescent, 2°–8° high in wild plants on the sands of the coast S., or much higher in conservatories, naked below; no threads to the leaves.*

Y. gloriòsa, Linn. Trunk low, generally simple; leaves coriaceous, smooth-edged, slender-spiny tipped, 1°–2° long, 1′–1½′ wide; flowers white, or purplish-tinged outside, in a short-peduncled panicle. N. Car., S.

Y. aloifòlia, Linn. SPANISH BAYONET. Trunk 4°–20° high, branching when old; leaves very rigid, strongly spiny-tipped, with very rough-serrulate, saw-like edges, 2° or more long, 1½′–2′ wide; the short panicle nearly sessile. N. Car. S.

50. CORDYLÌNE. (Greek: *club*, referring to the shape of the roots in some species.) Various species in choice conservatories, commonly known as DRACÆNAS, cultivated for the foliage, which is often handsomely colored.

C. indivìsa, Steud. Leaves 2°–4° long, and only an inch or two broad, long-tapering, curving, dark green. New Zealand.

C. austràlis, Hook. f. Hardier; leaves oblong-lanceolate, 2°–3° long and 2′–4′ broad, prominently striate. New Zealand.

C. Bánksii, Hook. f. Stem trunk-like and becoming several feet high; leaves long-lanceolate (4°–6° long), finely striate, with several prominent veins or ribs; flowers white. New Zealand; an excellent species, but not yet very common.

C. terminàlis, Kunth. The commonest one in cultivation, from tropical Asia; leaves 1°–2° long, lanceolate and coriaceous, narrowed to both ends, green, bronze or crimson, clustered near the ends of the branches or the top of the trunk (the latter ordinarily 4° or less high); flowers in branched panicles. Parent of most garden DRACÆNAS. C. CANNÆFÒLIA is a form of this.

CXX. PONTEDERIACEÆ, PICKEREL WEED FAMILY.

A few water plants, with perfect and more or less irregular flowers from a spathe, the perianth with 6 petal-like divisions and free from the 3-celled ovary; stamens 3 or 6, unequal or dissimilar, inserted in the throat of the perianth; style 1, the stigma 3- or 6-lobed or toothed.

* *Stamens* 6; *perianth funnel-form.*

1. PONTEDERIA. Flowers in a terminal spike. Perianth of 6 divisions irregularly united below in a tube, the 3 most united forming an upper lip of 3 lobes, the others more spreading and with more or less separate or lightly cohering claws forming the lower lip, open only for a day, rolling up from the apex downwards as it closes; the 6-ribbed base thickening, turning green, and inclosing the fruit. Stamens 6, the 3 lower in the throat, with incurved filaments; the 3 upper lower down and shorter, often imperfect. Ovary 3-celled, 2 cells empty, one with a hanging ovule. Fruit a 1-celled 1-seeded utricle.
2. EICHHORNIA. Differs in having the flowers spicate-racemose or paniculate, the 3 cells of the ovary all developing and each many-ovuled, the upper stamens included and the lower ones exserted. Plant (in ours) floating free.

* * *Stamens* 3; *perianth salver-form.*

3. HETERANTHERA. Flowers 1-few from a spathe which bursts from the sheathing side or base of a petiole. Perianth tube slender, the limb nearly equally parted and ephemeral. Capsule 1-celled or incompletely 3-celled, many-seeded.

1. PONTEDÈRIA, PICKEREL WEED. (*J. Pontedera*, an early Italian botanist.)

P. cordàta, Linn. Common P. Everywhere in shallow water; stem 1°–2° high, naked below, above bearing a single, petioled, heart-shaped and oblong or lance-arrow-shaped, obtuse leaf, and a spike of purplish-blue, small flowers; upper lobe with a conspicuous yellowish-green spot; flowers all summer. 2f

2. EICHHÓRNIA. (*J. A. F. Eichhorn*, a German.)

E. speciòsa, Kunth. (E. crássipes, Pontedèria azùrea). From S. Amer., now frequent in greenhouses, and in lily ponds in summer; leaf blade nearly orbicular, shining green, the petiole terete and swollen midway into a hollow bladder; flower large (1½′ long), violet, several in a raceme; roots feather-like and purplish, free in the water.

3. HETERANTHÈRA, MUD PLANTAIN. (Greek: *unlike anthers.*)

* *Stamens unequal, the two posterior with ovate yellow anthers, the other longer with an oblong or sagittate greenish anther.*

H. renifórmis, Ruiz. & Pav. In mud or shallow water, Conn., S. and W.; with floating, round-kidney-shaped leaves on long petioles, and 3–5 ephemeral white flowers, their perianth with a slender tube, bearing 6 nearly equal divisions.

H. limòsa, Vahl. In mud, Va., S. and W.; distinguished by its oblong or lance-oblong leaves, and solitary, larger, blue flower.

* * *Stamens all alike, with sagittate anthers.*

H. (or Schóllera) **gramínea**, Vahl. Water Star Grass. A grass-like weed growing under water in streams, from N. Eng., W. and S., with

branching stems beset with linear, pellucid, sessile leaves; the flower with a slender, pale yellow perianth, of 6 narrow, equal divisions raised to the surface on a very slender tube.

CXXI. COMMELINACEÆ, SPIDERWORT FAMILY.

Herbs with mucilaginous juice, jointed and mostly branching leafy stems, and perfect sometimes irregular flowers, having a perianth of usually 3 green and persistent sepals, and 3 ephemeral petals (these commonly melt into jelly the night after expansion); 6 stamens, some of them often imperfect, and a free 2–3-celled ovary; style and stigma one. Pod 2–3-celled, few-seeded. Leaves ovate to linear, flat, sheathing at the base. Not aquatic, the greater part tropical.

* *Perfect stamens* 3, *the other* 3 *with sterile cross-shaped anthers.*

1. COMMELINA. Flowers blue, irregular. Sepals unequal, 2 of them sometimes united by their contiguous margins. Two of the petals rounded and on slender claws, the odd one smaller or abortive. Filaments naked. Leaves abruptly contracted and sheathing at base, the uppermost forming a spathe for the flowers.

* * *Stamens all* 6 *perfect, or rarely* 1 *imperfect.*

2. TRADESCANTIA. Flowers regular. Petals all alike and distinct, ovate, sessile. Stamens with bearded filaments. Ovary 2–3-celled, the cells 2-ovuled. Erect herbs with flowers in axillary and terminal umbellate clusters or heads (Lessons, Fig. 330).
3. ZEBRINA. Flowers irregular. Calyx tubular below, either equally 3-parted, or 2-parted above and a broader lobe below. Corolla with a slender tube longer than the calyx, the lobes ovate and spreading, subequal. Filaments nude or bearded. Ovary 3-celled, each cell 1–2-ovuled. Trailing or scandent herbs, with flowers mostly in 2's.

1. COMMELÌNA, DAY FLOWER. (*J. & G. Commelin*, early Dutch botanical authors. A third brother published nothing. In naming this genus for them, Linnæus is understood to have designated the two former by the full-developed petals, the latter by the smaller or abortive petal.) Ours are branching perennials, or continued by rooting from the joints; in alluvial or moist shady soil; flowers all summer.

* *Cells* 1-*seeded; seeds smooth.*

C. erécta, Linn. Stem slender and low; leaves linear; cells all dehiscent. Penn., S.

C. Virgínica, Linn. S. N. Y., S. and W.; stems reclining and rooting at base; leaves oblong-lanceolate or narrower; spathes scattered, conduplicate, round-heart-shaped when laid open; odd petal inconspicuous; dorsal cell indehiscent, scabrous.

* * *Ventral cells usually* 2-*seeded* (2-*ovuled*), *and the dorsal one* 1-*seeded.*

C. nudiflòra, Linn. Slender and creeping, glabrous; leaves small and lanceolate; margins of the cordate-ovate spathe not united; seeds reticulated. Del. to Ind., and S.

C. hirtélla, Vahl. Stem erect (2°–4°) and stout; leaves larger, lanceolate, the sheaths brown-bearded; margins of the spathe united; seeds smooth. Penn., W. and S.

2. TRADESCÁNTIA, SPIDERWORT. (Named for the gardener-botanist *Tradescant.*) Leaves sheathed at the base. ♃

* *Umbels sessile at the end of the stem and branches between a pair of leaves, or later also in the lower axils; flowering in summer.*

T. Virgínica, Linn. W. N. Y., W. and S.; also in gardens; leaves lance-linear, tapering regularly from the base to the point, ciliate; umbels terminal; flowers blue, in garden varieties purple or white. There are forms with broader leaves, lower stature, and pubescent stems and leaves.

* * *Umbels one or two on a naked peduncle.*

T. ròsea, Vent. Sandy woods, Md., S. and W.; slender, 6′–12′ high, smooth, with linear, grass-like leaves, and rose-colored flowers ½′ wide.

3. ZEBRÌNA. (Name refers to the stripes often present on the leaves.)

Z. péndula, Schnitzl. (TRADESCÁNTIA ZEBRÌNA and T. TRÍCOLOR). WANDERING JEW. Common in greenhouses and window baskets; spreads by branching and rooting freely; the lance-ovate or oblong rather succulent leaves crimson beneath, and green or purplish above, often variegated with two broad stripes of silvery white. Mexico. ♃

CXXII. ALISMACEÆ, WATER PLANTAIN FAMILY.

Marsh herbs, with flowers on scapes or scape-like stems, in panicles, racemes, or spikes, with distinct calyx and corolla, viz. 3 persistent green sepals and 3 conspicuous white petals, and many distinct pistils which are 1-celled and mostly 1-ovuled; stamens 6 or more, on the receptacle. Flowers long-stalked, loosely racemed or panicled, with dry lanceolate bracts at the base. Fruit an akene in ours. Leaves sheathing, sometimes reduced to petioles. Juice sometimes milky.

1. ALISMA. Flowers perfect, loosely panicled. Petals involute in the bud. Stamens 6. Ovaries many, in a ring, very flat-sided, becoming coriaceous flat akenes, 2–3-keeled on the back.
2. ECHINODORUS. Flowers perfect, in proliferous umbels. Petals imbricated in the bud. Stamens 9 or more. Ovaries heaped in a head, becoming wingless akenes.
3. SAGITTARIA. Flowers monœcious, rarely dicœcious or polygamous, in successive whorls, the sterile at the summit of the scape; the lowest fertile. Stamens usually numerous. Ovaries very many, heaped on the globular receptacle, in fruit becoming flat and winged akenes.

1. ALÍSMA, WATER PLANTAIN. (The old Greek name, of uncertain meaning.) Flowers all late summer.

A. Plantàgo, Linn. Shallow water; leaves long-petioled, varying from ovate or oblong-heart-shaped to lanceolate, 3–5-ribbed; panicle 1°–2° long, of very many and loose, small, white flowers. Variable. ♃

2. ECHINÓDORUS. (From Greek words for *prickly flask*, the head of fruit being as it were prickly-pointed by the styles, but hardly so in our species.) The following occur in muddy or wet places; flowers summer; the flowering shoots or scapes mostly proliferous and creeping.

E. párvulus, Engelm. A tiny plant, 1′–3′ high, with lanceolate or spatulate leaves, few-flowered umbels, 9 stamens, and almost pointless akenes. Mass., W. and S. ①

E. rostràtus, Engelm. Leaves broadly heart-shaped (1′–3′ long, not including the petiole), shorter than the erect scape, which bears a panicle of proliferous umbels; flower almost ½′ wide; 12 stamens; akenes beaked with slender styles. Ill., W. and S. ①

E. radìcans, Engelm. Leaves broadly heart-shaped and larger (3′–8′ wide), which are very open or almost truncate at base; the creeping scapes or stems becoming 1°–4° long and bearing many whorls; flowers ½′–¾′ broad; akenes short-beaked. Ill., W. and S. ♃?

3. SAGITTÀRIA, ARROWHEAD. (From the Latin for *arrow*, on account of the sagittate leaves which prevail in the genus.) In shallow water; flowers all summer. ♃

* *Filaments long and slender, i.e. as long as the linear-oblong anthers.*

S. variábilis, Engelm. The common species everywhere, exceedingly variable; almost all the well-developed leaves arrow-shaped; filaments nearly twice the length of the anthers, smooth; sepals reflexed after flowering; akenes broadly obovate, with a long and curved beak; calyx remaining open. The lobes of the leaves are sometimes very narrow-linear (var. **grácilis**, Engelm), and sometimes the petioles, upper part of the scape, the bracts, and sepals are pubescent (var. **pubéscens**, Engelm). Other well-marked forms occur.

S. Montevidénsis, Cham. & Schlecht. From S. Amer., now frequently grown in aquaria; distinguished from the above by a deep purple spot at the base of the flower inside, thick pedicels of the pistillate flowers, and sepals erect after flowering.

S. lancifòlia, Linn. Common from Md. and Ky., S.; with the stout leaves 1°–3° and scapes 2°–5° high, the coriaceous blade of the former lance-oblong and always tapering into the thick petiole, the nerves nearly all from the thick and prominent midrib.

S. calycìna, Engelm. Along rivers, often much immersed; many of the leaves linear or with no blades; the others mostly halberd-shaped; scapes weak, 3′–9′ high; pedicels with fruit recurved; filaments roughish, only as long as the anthers; akenes obovate, tipped with short horizontal style; calyx appressed to head of fruit and partly covering it; the fertile flowers show 9–12 stamens, the sterile occasionally some rudiments of pistils. Me., W. and S.

* * *Filaments very short and broad.*

S. heterophýlla, Pursh. Scapes 3′–2° high, weak; the fertile flowers almost sessile, the sterile long-pediceled; filaments glandular-pubescent; akenes narrow-obovate, with a long, erect beak; leaves linear, lanceolate or lance-oblong, arrow-shaped with narrow lobes or entire. N. Eng., W. and S.

S. gramínea, Michx. Common S.; known from the foregoing by the slender pedicels of both kinds of flowers; small, almost beakless akenes; and leaves rarely arrow-shaped; the phyllodia flat. N. Eng., W. and S.

S. tères, Watson. N. Eng. to N. J., in shallow water; scape 6′–20′ high; phyllodia terete, acutely attenuate upwards, very rarely with a narrow blade; pedicels all very slender and spreading, in 1–3 whorls; filaments 12, dilated and pubescent; akene obovate, with an erect beak, the margins crenate-crested.

S. nàtans, Michx., var. **loràta**, Chapm. Known by the small size (1′–3′ high), few flowers, usually only one of them fertile and recurved in fruit; stamens only about 7, with glabrous filaments; akenes obovate, with erect beak; and leaves without a true blade. N. Y., S., near the coast.

Four small families, mostly of rush-like plants, are somewhat related to the foregoing, but they are unattractive to the beginner and are rather too recondite for description here. For their study, the Manual should be consulted. These are

CXXIII. XYRIDACEÆ, YELLOW-EYED GRASS F.

Small, rush-like herbs, with equitant leaves, like Bulrushes in having flowers in a head or spike, one under each firm glume-like bract, but with a regular perianth of 3 sepals and 3 colored (yellow) petals; also a 1-celled many-seeded ovary and pod with 3 parietal placentæ, and a 3-cleft stigma. Over a dozen species of XYRIS in our territory, mostly in boggy places or pine barrens.

CXXIV. MAYACEÆ, MAYACA FAMILY.

Moss-like aquatic plants, densely clothed with narrow-linear, sessile, and pellucid leaves, and bearing axillary, naked, 1-flowered peduncles, the perfect white flower 3-androus. One species, MAYACA MICHAUXII, in shallow water, Va., S.

CXXV. ERIOCAULONACEÆ, PIPEWORT FAMILY.

Another small group of marsh or aquatic herbs, of rush-like appearance, with a head of monœcious, white-bearded flowers, in structure somewhat like the Yellow-eyed Grass, terminating a naked scape, at the base of which is a tuft of grassy awl-shaped, linear, or lanceolate leaves of loose cellular texture, not equitant, but the upper surface concave. A half dozen species in the genera ERIOCAULON, PÆPALANTHUS, LACHNOCAULON.

CXXVI. JUNCACEÆ, RUSH FAMILY.

Plants with the appearance and herbage of Sedges and Grasses, yet with flowers of the structure of the Lily Family, having a complete perianth of 6 parts, 3 outer and 3 inner, but greenish and glume-like. Stamens 6 or 3, style 1; stigmas 3.

1. JUNCUS. Ovary and pod 3-celled or almost 3-celled, many-seeded. Herbage smooth; stems often leafless, generally pithy.
2. LUZULA. Ovary and pod 1-celled, with 3 parietal placentæ, and one seed to each. Stems and leaves often soft-hairy.

The only conspicuous species is JUNCUS EFFUSUS, Linn., the COMMON BULRUSH, in low grounds; has soft and pliant stems in clumps, 2°–4° high; panicle of many greenish flowers; 3 stamens; and very blunt pod.

II. Spadiceous Division.

Flowers either naked, i.e. destitute of calyx and corolla, or these, if present, not brightly colored, collected in the sort of spike called a spadix, which is embraced or subtended by the kind of developing bract termed a spathe. The most familiar examples of this division are offered by the Arum Family. There are various exceptions to this style of inflorescence, and the division, like all others, is merely artificial, but it will serve to aid the beginner. The first two families are too difficult for the beginner.

CXXVII. NAIADACEÆ, PONDWEED FAMILY.

Marsh or aquatic plants with stems mostly leafy and jointed, the leaves stipulate or sheathing, the flowers (sometimes not spathaceous) perfect or unisexual, with 4 or 6 distinct inconspicuous segments, or the perianth tubular, or even wanting. Stamens 1–6. Ovaries 1–6, distinct or nearly so, 1-celled and usually 1-ovuled, the fruit follicular or fleshy. Our genera are Triglochin, Scheuchzèria, with bladeless leaves, allied to the water Plantain Family, the former with naked, scape-like stems; and Potamogèton, the Pondweeds, with many difficult species, Rúppia and Zostèra, grass-like immersed plants on the seacoast, Zannichéllia, a similar plant in fresh water, and Nàias, slender and inconspicuous branchy plants, mostly in fresh water.

CXXVIII. LEMNACEÆ, DUCKWEED FAMILY.

Minute, stemless plants reduced to a floating leaf-like body three fourths inch or less long (in Lémna) or even to minute, green grains (in Wólffia). The least of flowering plants.

CXXIX. ARACEÆ, ARUM FAMILY.

Perennial herbs with pungent or acrid watery juice, leaves often with veins reticulated so as to resemble those of Dicotyledons, small perfect or imperfect flowers in a fleshy head or spike called a spadix, usually furnished with the colored or peculiar enveloping bract called a spathe. Floral envelopes

4–6, or 0. Fruit generally a berry. A large family in the tropics, and comprising many plants of choice collections, cultivated for the foliage, or for the showy, so-called "flowers," which are really colored spathes.

* *Plants with expanded leaf blade (never linear), and with spreading nerves or veins.*

\+ *Spadix surrounded by a conspicuous, generally colored, spathe.*

\++ *Leaves (in ours) compound.*

1. ARISÆMA. Leaves only one or two, with stalks sheathing the simple stem, which rises from a fleshy corm, and terminates in a long spadix bearing nude flowers only at its base, where it is enveloped by the convolute lower part of the greenish or purplish spathe. Sterile flowers above the fertile, each of a few sessile anthers; the fertile each a 1-celled 5–6-ovuled ovary, in fruit becoming a scarlet berry; commonly diœcious, the stamens being abortive in one plant, the pistils abortive in the other.

\++ \++ *Leaves simple.*

= *Foliage of ordinary size, the leaves arrow-shaped or heart-shaped, or sometimes nearly lanceolate.*

‖ *Spathe convolute (its margins overlapping below) about the spadix.*

2. ARUM. Leaves hastate or sagittate, with the scape from a thick rhizome. Spathe convolute below, large, the blade ovate or ovate-lanceolate, mostly dark-colored, spotted or green. Spadix shorter than the spathe, sessile. Flowers without envelopes, monœcious, the staminate above. Ovary oblong and obtuse, 1-celled, 6–∞-seeded. Berry obovoid, many-seeded.
3. PELTANDRA. Leaves arrow-shaped; these and the scape from a tufted fibrous root. Spathe convolute to the pointed apex, green, wavy-margined. Spadix long and tapering, covered completely with nude flowers, i.e. above with naked shield-shaped anthers each of 5 or 6 cells, opening by a hole at the top, below with 1-celled ovaries bearing several erect ovules, in fruit a 1–3-seeded fleshy bag. Seeds obovate, surrounded by a tenacious jelly.
4. RICHARDIA. Leaves arrow-shaped; these and the long scape from a short tuberous rootstock. Spathe broad, spreading above, convolute at base around the slender cylindrical spadix, which is densely covered above with yellow anthers, below with ovaries, each incompletely 3-celled, and containing several hanging ovules. Flowers with no envelopes.

‖ ‖ *Spathe shell-form or hooded, inclosing the globular spadix, in which the flowers are as it were nearly immersed.*

5. SYMPLOCARPUS. Leaves ovate, very large and veiny, short-petioled, appearing much later than the flowers from a fibrous-rooted corm or short rootstock. Spathe ovate, incurved, thick, barely raised out of the ground. Each flower has 4 hooded sepals, 4 stamens with 2-celled anthers turned outwards, and a 1-celled, 1-ovuled ovary tipped with a short awl-shaped style; the fruit is the enlarged spongy spadix under the rough surface of which are imbedded large fleshy seeds.

‖ ‖ ‖ *Spathe open and spreading (not rolling around the spadix).*

6. CALLA. Leaves heart-shaped, on long petioles; these and the peduncles from a creeping rootstock. Spathe open, the upper face bright white, spreading widely at the base of the oblong spadix, which is wholly covered with the nude flowers; the lower ones perfect, having 6 stamens around a 1-celled ovary; the upper often of stamens only. Berries red, containing a few oblong seeds, surrounded with jelly.
7. ANTHURIUM. Leaves various. Plant sometimes with a distinct stem or trunk (even climbing in some species). Flowers all perfect and fertile, and with a 4-parted perianth, the spadix generally elongated and prominent. Spathe ovate to lanceolate, widely spreading or reflexed, thickish and mostly of a waxy texture. Ovary 2-celled, with 1–2 ovules in each cell, but usually only 1 seed in each fruit.

= = *Foliage very large, often handsomely colored, the leaves usually peltate.*

8. COLOCASIA. Leaves peltate, and with a notch at the base. Spathe convolute, yellowish, much longer than the spadix, the limb spreading; the latter covered with ovaries at base, above with some abortive rudiments, still higher crowded with numerous 6–8-celled sessile anthers, and the pointed summit naked. Ovary 1-celled, with numerous ovules in 2 series.

9. CALADIUM. Leaves mostly peltate, notched at the base, rich green or party-colored. Spathe convolute, constricted at the throat, white, the limb boat-shaped, longer than the stipitate spadix; the latter with staminate flowers above and ovaries below. Ovary 2–3-celled, with many ovules in each.

+ + *Spadix naked; i.e., the spathe incomplete and distant, appearing like a bract on the scape.*

10. ORONTIUM. Leaves oblong and veiny, unequilateral, blunt, abruptly narrowed into a stout petiole. Flowers perfect, crowded on the narrow short spadix, with 4 or 6 sepals and as many stamens. Ovary 1-celled, 1-ovuled, becoming a green utricle.

* * *Plants with leaves linear, flag-like, nerved; spadix appearing lateral.*

11. ACORUS. Spadix cylindrical, naked, emerging from the side of a 2-edged simple scape resembling the leaves, densely covered with perfect flowers. Sepals 6, concave. Stamens 6, with linear filaments and kidney-shaped anthers. Ovary 2–3-celled, with several hanging ovules in each cell, becoming dry in fruit, ripening only one or two small seeds.

1. ARISÆMA, INDIAN TURNIP, etc. (Greek: *blood arum*, from the spotted leaves of some species.) Veiny-leaved plants, their turnip-shaped corm farinaceous, but imbued with an intensely pungent juice, which is somewhat dissipated in drying. 2l

A. triphýllum, Torr. COMMON INDIAN TURNIP. In rich woods; leaves mostly 2, each of 3 oblong, pointed leaflets; stalks and spathe either green or variegated with whitish and dark purple stripes or spots, the latter with broad or flat summit incurved over the top of the club-shaped and blunt spadix.

A. Dracóntium, Schott. DRAGON ARUM, DRAGON ROOT, or GREEN DRAGON. Low grounds; leaf mostly solitary, its petiole 1°–2° long, bearing 7–11 pedate, lance-oblong, pointed leaflets; the greenish spathe wholly rolled into a tube with a short slender point, very much shorter than the long and tapering tail-like spathe.

2. ÁRUM. (Ancient name.) The DRAGON PLANT of Eu., known as A. DRACÚNCULUS (but properly DRACÚNCULUS VULGÀRIS, Schott.), with pedate leaves and brown spathe, is sometimes cultivated.

A. palæstìnum, Boiss. (A. SÁNCTUM of plant merchants.) BLACK CALLA. Spathe about 1° long, mossy-green or purplish outside, rich velvety black inside and yellowish-white at the base of the tube, standing above the leaves, the latter triangular-hastate. Syria, etc.

3. PELTÁNDRA, ARROW ARUM. (Greek words meaning *shield-shaped stamen*, from the form of the anthers.) Flowers summer. 2l

P. undulàta, Raf. Root fibrous; scape about equaling the leaves, 1°–1½° high; lobes of the leaves acutish, rather long; spathe greenish, wavy on the margin; sterile (upper) portion of the spadix several times longer than the pistillate portion. Ponds, N. Eng., W. and S.

P. álba, Raf. Root tuberous; lobes of the leaves short and broad, obtuse; spathe shorter, white, not wavy; sterile portion of the spadix about the length of the pistillate portion. N. Car., S.

4. RICHÁRDIA. (Named for the French botanist, *L. C. Richard.*) The first species is referred by some recent writers to the genus ZANTEDÉSCHIA. 2l

R. Africàna, Kunth. ÆTHIOPIAN OR EGYPTIAN CALLA, CALLA LILY, of common house culture, but a native of the Cape of Good Hope and not a true Calla. A familiar plant, with glossy-green, broadly sagittate leaves and large, pure white spathes. There are dwarf varieties.

R. álbo-maculàta, Hook. f. SPOTTED CALLA. Leaves long-hastate, cuspidate at the end, with oblong, white blotches; spathe smaller than in the last, greenish-white. Cape of Good Hope.

R. hastàta, Hook. f. YELLOW CALLA. Leaves soft, hastate-ovate, cuspidate, not spotted; spathe greenish-yellow, with a long-cuspidate limb. Cape of Good Hope.

5. SYMPLOCÁRPUS, SKUNK CABBAGE. (Greek for *fruit grown together.*) 2l

S. fœtidus, Salisb. The only species, in swamps and wet woods, mostly N.; sending up, in earliest spring, its purple-tinged or striped turtle-head-like spathe inclosing the head of flowers, and later the large leaves, when full grown 1°–2° long, in a cabbage-like tuft; the fruit 2′–3′ in diameter, the hard bullet-like seeds almost $\frac{1}{2}$′ wide, ripe in autumn.

6. CÁLLA, WATER ARUM. (An ancient name.) Flowers early summer. 2l

C. palústris, Linn. Cold and wet bogs from Penn., N.; a low and small, rather handsome plant; leaves 3′–4′ long; filaments slender; anthers 2-celled.

7. ANTHÙRIUM. (Greek: *tail flower*, referring to the projecting spadix.) Many species are cultivated in choice collections, but the following are probably the commonest, the two first being grown for the gaudy spathes and spadices, and the two last chiefly for the fine foliage.

* *Leaves ovate-lanceolate or narrower.*

A. Scherzeriànum, Schott. Leaves evergreen, oblong-lanceolate, deep, rich green, spreading or recurved, tapering at the base, 1°–2° long, the blade not oblique; scapes slender and surpassing the leaves, bright red; spathe ovate-oblong, somewhat cordate, brilliant red (like the spadix), 3′–4′ long. There are many forms in cultivation, including one or two with white spathes. Guatemala.

A. Andræànum, Linden. Leaves ovate-lanceolate, cordate at the base, deep green, the blade oblique or hanging on the petiole; scapes somewhat overtopping the leaves; spathe broadly ovate and cordate, 6′–10′ long, wrinkled, orange-red; the spadix yellowish. Colombia.

* * *Leaves ovate or broader.*

A. crystállinum, Linden & André. Leaves broadly ovate and deeply cordate, acuminate, bright velvety green, and the principal veins margined with crystal-white (violet color when young), the blade hanging or oblique on the petiole; spathe linear-oblong, acuminate, green. Peru.

A. magníficum, Linden. Leaves large, broadly ovate, abruptly acuminate; the basal lobes large and rounded, the blade hanging; spathe short-oblong and recurved, both it and the spadix green. Colombia.

8. COLOCÀSIA. (The ancient Greek name of the common species.) 2l

C. antiquòrum, Schott. One variety (var. ***esculénta***, Schott.) cult. in the hot parts of the world for its farinaceous, thick rootstocks (which are esculent when the acrid principle is driven off by heat, as also the leaves), and in gardens for its magnificent foliage, the pale ovate-arrow-shaped leaves being 2°–3° long when well grown; the stalk attached much below the middle, the notch not deep.

9. CALÀDIUM. (Name obscure.) Well-known plants grown in glass houses for their great leaves, which are now broken up into very many styles of markings. The specific types are often unrecognizable in the horticultural varieties, but most of them have come from the two following Brazilian species.

C. bícolor, Vent. The chief species; rhizome depressed-globose; leaves sagittate-ovate or ovate-triangular, the upper portion nearly ovate and narrowly cuspidate at the apex; the lobes oblong-ovate and obtuse and more or less connate, the blade variously colored above and somewhat glaucous below; tube of spathe green outside, but whitish-green or violet inside, the limb white and cuspidate and scarcely twice longer than the tube; pistillate portion of the spadix yellow or pale orange, the sterile portion narrow and of about equal length.

C. picturàtum, C. Koch. Rhizome spherical and tuberculous; leaves sagittate-lanceolate, the upper portion triangular to ovate-lanceolate, the lobes lanceolate and somewhat acute and mostly not connate, the blade variously colored above and pale beneath; spathe tube green outside, purplish- or yellowish-green inside, the limb cuspidate-apiculate and shorter than the tube, white or yellowish; sterile portion of spadix shorter than pistillate portion.

10. ORÓNTIUM, GOLDEN CLUB. (Name obscure.)

O. aquáticum, Linn. Leaves and scapes arising from a deep rootstock; scape 1°–2° high, mostly decumbent; the spike or spadix 2′–3′ long and scarcely thicker than the scape. Ponds, Mass., S.; the only species.

11. ÁCORUS, SWEET FLAG or CALAMUS. (Ancient name, of obscure origin.) 2l

A. Cálamus, Linn. Common Sweet Flag. In wet grounds; sending up the 2-edged sword-shaped leaves, 2° or more high, from the horizontal, pungent, aromatic rootstock; flowers early summer. There is a striped-leaved variety.

CXXX. TYPHACEÆ, CAT-TAIL FAMILY.

Perennial marsh herbs, or some truly aquatic, with linear and straight-nerved erect (unless floating) long sessile leaves, sheathing at base, and monœcious flowers on a dry spadix, destitute of calyx and corolla; the fruit dry and nut-like, 1-seeded, rarely 2-seeded.

1. TYPHA. Flowers indefinite, in a dense cylindrical spike terminating the long and simple reed-like stem; the upper part of stamens only, mixed with long hairs; the

lower and thicker part of slender-stalked ovaries tapering into a style and below surrounded by numerous club-shaped bristles, which form the copious down of the fruit.

2. SPARGANIUM. Flowers collected in separate dense heads, scattered along the summit of the leafy stem; the upper ones of stamens only with some minute scales interposed, the lower of pistils, each ovary with a few small scales at its base, the whole ripening into a spherical head of small nuts, which are wedge-shaped below and with a pointed tip.

1. TÝPHA, CAT-TAIL FLAG. (Greek, for *fen*, in which these plants abound.) Flowers early summer.

T. latifòlia, Linn. COMMON C. or REED-MACE. With flat leaves, these and the stem 6°–10° high; pistillate flowers without bractlets; no interval between the sterile and fertile part of the spike. Common in marshes.

T. angustifòlia, Linn. NARROW-LEAVED C. Less common, mostly near the coast, smaller; leaves narrower, more channeled toward the base; pistillate flowers with hair-like bractlets; commonly a space between the sterile and the fertile part of the spike.

2. SPARGÀNIUM, BUR REED. (Name from Greek for a *fillet*, alluding to the ribbon-shaped leaves.) Flowers summer.

* *Fruit sessile, broad and truncate, often 2-seeded.*

S. eurycárpum, Engelm. GREAT B. Border of ponds and streams N. Eng. to Va., and W.; 3°–5° high, with panicled-spiked heads, the fertile when in fruit 1½′′ thick, the nuts broad-tipped; stigmas 2; leaves ½′–¾′ wide, flat on upper side, keeled and concave-sided on the other.

* * *Fruit slightly stipitate, narrower, always 1-celled.*

S. símplex, SMALLER B. In water; erect, or sometimes floating; 1°–2° high, mostly with a simple row of heads; leaves narrower; stigma simple, linear, as long as the style; nuts tapering to both ends and with a stalked base. N. Eng. to N. J., and W. Very variable.

S. mínimum, Fries. SMALLEST B. Mostly with leaves floating in shallow water (6′–10′ long) and flat; heads few; stigma simple, oval; nuts oval, short-pointed and short-stalked. N. Eng. to Penn., and W.

CXXXI. PANDANACEÆ, SCREW PINE FAMILY.

Represented in greenhouses by PÁNDANUS ÙTILIS, Bory, the striped-leaved P. VÈITCHII, Hort., and some other species of the same genus, known as SCREW PINES, all tropical. They are palm-like bushes, ranging from 5°–15° high as commonly grown, with prickly-toothed ensiform stiff leaves crowded on woody stems. They seldom blossom in conservatories. The flowers are dicœcious, the staminate ones in a mostly branched spadix, the pistillates in a simple dense spadix. Spathes persistent or deciduous, dry or colored. Perianth 0. Stamens numerous. Ovary 1-celled, or the ovaries united into a 2–∞-celled compound one. Fruit berry-like or a woody drupe.

CXXXII. PALMACEÆ, PALM FAMILY.

Tree-like or bushy, with thick woody trunk-like stem, growing from the terminal bud, and a spadix of small perfect or imperfect flowers; sepals and petals each 3, distinct or connate; stamens usually 6, in 2 series, opposite the sepals and petals; staminodia sometimes present; ovary free, 1–7-celled (commonly 3-celled), sometimes lobed or divided into nearly separate carpels; fruit a berry, or a dry or more or less fleshy drupe. There are three genera in our region (more in extreme S. Florida).

* *Style or stigma from the base of the ovary.*

1. SABAL. Flowers perfect. Ovary 3-lobed, the style short, stigma truncate. Spadix long-branching, glabrous, longer and shorter than the leaves. Either low or tall species of fan-palms, without spines.

* * *Style or stigma from the top of the ovary.*

2. RHAPIDOPHYLLUM. Flowers polygamo-dioecious, the segments imbricated in the bud. Carpels free, the stigmas sessile and distinct. Spadix branching and densely flowered, small, short-peduncled. Low palms, with fan-like, long-stalked leaves and dry spiny sheaths.

3. SERENÆA. Flowers perfect, the segments valvate. Carpels free at the base, the style one, long and slender. Spadix long and branching, densely tomentose, much shorter than the leaves. Stem creeping. Leaves fan-like. No spines.

1. SÀBAL, PALMETTO. (Name unexplained.)

S. Palmétto, Rœm. & Schult. CABBAGE PALMETTO. Of the sandy coast from N. Car., S., our only tree palm; stem 20°–40° high, erect and simple, leafy at the summit, the petiole smooth; leaves 5°–8° long, cordate in outline, pinnatifid, and recurved at the summit, with thread-like filaments in the sinuses; drupe globose; spadix spreading, mostly shorter than the leaves.

S. Adansònii, Guerns. DWARF PALMETTO. Leaves rising from a stem underground, smooth-edged, and circular in outline, slightly pinnatifid, glaucous, with a few filaments in the sinuses, the petiole smooth; fruit globose; spadix erect and much longer than the leaves. Low districts, N. Car., S.

2. RHAPIDOPHÝLLUM. (Greek: *Rhapis-leaved*, from its resemblance to the genus Rhapis.)

R. (or CHAMÆROPS) **Hýstrix**, Wendl. & Drude. BLUE PALMETTO. S. Car., S.; stems erect or creeping, only 2°–3° long; leaves pale or glaucous, 3°–4° high, circular in outline, with numerous 2–4-toothed divisions, the petiole rough-edged; spathes oblong and woolly; drupe ovoid. The only species.

3. SERENÆA. (Named for *Sereno Watson*, late curator of the Gray Herbarium, Cambridge, Mass.)

S. serrulàta, Hook. f. SAW PALMETTO. Trunk creeping on the ground; short petioles spiny-margined, whence the popular name; leaves circular, with 15–30 erect slightly cleft divisions and no thread-like fila-

ments in the sinuses; drupe ovoid-oblong. Sandy soil, S. Car., S.; the only species.

The Cocoanut (Còcos nucífera) and the Date Palm (Phœnix dactylífera) are cultivated in the extreme south, the former along the coast of southeastern Florida. Many palms are grown in conservatories, of which the following are some of the commonest:

* Fan Palms; i.e., *those with leaves circular in general outline (but often deeply cleft) and digitate-veined.*

Livistòna Chinénsis, R.Br. (Latánia Borbónica). S. China; leaves green, 4°–6° across, on spiny petioles of about the same length, the blade cut into many hanging segments which extend one fourth or one third its depth. A common species with very wide-spreading growth.

Chamærops hùmilis, Linn. Mediterranean region; dwarf species, with leaves glaucous on both sides, the blades divided nearly to the base into 12–20 erect, nearly linear segments; petioles twice longer than the leaves (3°–4°), with stout spines on the edges.

Thrìnax radiàta, Lodd. (T. élegans). S. Amer.; leaves green, either glabrous or puberulent beneath, 1°–2½° long, the blade divided two thirds its length into 40 or more very slender spreading or recurved divisions; petioles slender but stiff, longer than the leaves. Known for its graceful habit and umbrella-like foliage.

Rhàpis flabellifórmis, Linn. f. China and Japan; stems several and slender, erect, with persistent leaf sheaths; leaves rather small, the blade 5–11-parted into plaited truncate or erose ciliate-margined divisions, the petiole much longer than the blade, and very obscurely denticulate.

* * Feather Palms; i.e., *the leaves long and pinnate or pinnately parted.*

Chrysalidocárpus (or Arèca) ***lutéscens***, Wendl. Madagascar; one of the best of the feather-palms for general culture; leaves very long (4°–10°), erect-spreading and arching at the top, light green, the pinnæ 70–100, alternate, lanceolate and long-pointed; petiole shallow-grooved on top, especially in its lower half.

Howèa (Kéntia) ***Belmoreàna***, Becc. E. Indies; leaf blade much shorter than in the last, the pinnæ more nearly opposite and 20–50 in number; petiole flat on top.

Ptychospérma Cunninghámii, Wendl. (Seafórthia élegans). Australia; trunk slender and shedding its sheaths, terete; leaves 4°–10° long, with many very slender pinnæ which are unequally bifid at the apex, dark green above and silvery beneath.

Hyophòrbe Verschaffélti, Wendl. Small or medium sized palm from Madagascar, with nearly erect leaves, 4°–6° long, and curving gracefully at the end; midrib white, unarmed; pinnæ narrow-lanceolate, 10–30 pairs, 2′ or less wide; stem triangular from the sheathing leaf bases.

Geonòma grácilis, Wendl. Costa Rica; a graceful, small species with long-arching, pinnate leaves which are red when young, but becoming dark green; monœcious.

Chamædórea élegans, Mart. Mexico; dwarf species with unarmed stem; diœcious; leaves 2°–4° long, drooping; pinnæ 10′ or less long and 1′ broad, but tapering each way; petioles slightly channeled.

Còcos Weddelliàna, Wendl. S. Amer.; a very elegant, small palm, with a slender, fibrous-netted trunk; leaves 2°–6° long, dark green above and glaucous beneath, gracefully curved; pinnæ numerous and very narrow; petiole short. Popular, and stands rough usage.

Caryòta sobolífera, Linn. A rather small palm of tropical Asia, distinguished by 2-pinnate leaves, the pinnulæ fish-tail-shape; petioles black-scaly when young; foliage bright green and graceful; plant suckers from the root. Useful species for decorative work.

III. Glumaceous Division.

Flowers inclosed or subtended by glumes or husk-like bracts; no proper calyx or corolla, except sometimes minute bristles or scales which represent the perianth. Stems of the straw-like sort, called *culms*.

CXXXIII. CYPERACEÆ, SEDGE FAMILY.

Some rush-like, others grass-like plants, with flowers in spikes or heads, one in the axil of each glume, the glume being a scale-like or husk-like bract. No calyx nor corolla, except some vestiges in the form of bristles or occasionally scales, or a sac which imitates a perianth; the 1-celled 1-ovuled ovary in fruit an akene. Divisions of the style 2 when the akene is flattish or lenticular, or 3, when it is usually triangular. Leaves, when present, very commonly 3-ranked, and their sheath a closed tube; the stem not hollow. A large family, to be studied in the Manual, and too difficult for the beginner. The most prominent genera are the following:

* *Flowers commonly all perfect.*

+– *Spikelets usually many-flowered with only one or two of the lower scales without flowers.*

+– *Scales 2-ranked, the spikelet therefore flat.*

= *No bristles about the akene, and no beak at its top.*

1. **CYPÈRUS.** Spikelets few–many-flowered, mostly flat and slender, in simple or compound terminal umbels or heads. Culms mostly triangular and simple, most of the leaves at the base. Many species in low grounds; three should be mentioned here:

C. rotúndus, Linn. Nut Grass, Coco Grass. A bad weed in sandy lands from L. I., S.; early leaves grass-like and tufted, 3′–6′ high, followed later in the season by a single, leafless, triangular culm, 6′–20′ high; umbel simple or slightly compound, about equaling its involucral leaves, its rays few, and each one bearing 4–9 dark-chestnut, 12–40-flowered, acute spikelets; scales nerveless. The plant is introduced in the N. It persists in the soil by means of little, nut-like tubers which are borne from several inches to 4° away from the base of plant, on stolons.

C. esculéntus, Linn. Chufa. Cultivated, especially at the S., for its edible tubers, which are clustered about the base of the plant, and also wild; early leaves 15′–30′ high, slightly rough, about as long as the stem; umbel 4–7-rayed, sometimes compound, much shorter than the involucral leaves; spikelets numerous and light colored, 12–30-flowered, the scales nerved. The cultivated form rarely flowers in the N.

C. alternifòlius, Linn. Umbrella Plant. A greenhouse aquatic from Madagascar; culms in clumps, 2°–6° tall, smooth and triangular, leafless below, but bearing a leafy, many-rayed, great involucre at the top, from the axils of which spring slender-peduncled small clusters of flowers.

C. Papỳrus, Linn. (Papỳrus antiquòrum). Egyptian Paper Plant. Sometimes grown in aquaria, not hardy N.; sends up a jointless triangular stem 4°–10° high, which is terminated by a great involucre of very narrow drooping or bending leaves.

= = *Bristles about the akene, which is beaked on top.*

2. **DULÍCHIUM**. Spikelets 6–10-flowered, sessile in 2 ranks on axillary peduncles springing from the sheaths of the leaves. Perianth composed of 6–9 barbed bristles.

One species, **D. spathàceum**, Pers., in bogs and on borders of ponds, remarkable in the family for having terete and hollow culms, 1°–2° high.

+ + *Scales not 2-ranked, the spikelet therefore terete.*

= *Bristles* 0; *culm leafy.*

3. **FIMBRÍSTYLIS**. Spikelets umbelled, the involucral leaves 2–3. Small plants of either low or dry grounds, of about a half dozen species in our territory.

= = *Bristles generally present; culm leafy or naked.*

‖ *Style somewhat thickened or bulbous at the base, and persistent upon the top of the akene.*

4. **ELEÓCHARIS**. Spike one, and without involucre, terminating a slender, simple, leafless culm. Many species (mostly small) in moist grounds and borders of ponds.

‖ ‖ *Style not swollen at the base, deciduous.*

5. **SCÍRPUS**. Spikelets generally clustered in a compound umbel. Bristles (sometimes 0) barbed. Mostly tall, rush-like, leafy, common plants, but in some species the stems are slender and leafless, and the spike is single and terminal, thus approaching Eleocharis, but the involucre is present in the form of a scale or small leaf. This genus now includes Isólepis, to which the slender species with a solitary terminal spike, leafless and jointless culms, have been referred.

6. **ERIÓPHORUM**. Like Scirpus, but the bristles not barbed and often becoming silky and long exserted in fruit. A few plants in bogs, mostly distinguished when mature by the white, or rusty, woolly heads.

+ + *Spikelets only* 1–2-*flowered, and* 2 *or many of the lower scales flowerless.*

7. **RHYNCHÓSPORA**. Spikelets flattish, clustered, or panicled, often whitish or rusty in color. Bristles usually surrounding the beaked or tubercle-topped akene. A score of critical species, mostly small and slender plants, in bogs.

8. **CLÀDIUM**. Spikelets terete. Akene not tubercled, and no bristles. A single species, **C. mariscoìdes**, Torr., 1°–2° high, in wet places, with small, rusty cymes of capitate spikelets.

* * *Flowers unisexual (plants monœcious or dicœcious).*

9. SCLÈRIA. Monœcious. No bristles, and the bony or crustaceous akene naked. About a score of small plants known as NUT RUSH.

10. CÀREX. Monœcious or dicœcious. Ordinarily no bristles, but the lenticular or triangular akene inclosed in a sac or *perigynium*. A vast genus, comprising over 200 species in our region, much too difficult for the beginner. Common in all low grounds and in open woods.

CXXXIV. GRAMINEÆ, GRASS FAMILY.

Grasses, known from other glumaceous plants by their 2-ranked leaves having open sheaths, the jointed stems commonly, but not always hollow, and the glumes in pairs, viz. a pair to each spikelet even when it consists of a single flower (these called *glumes* proper), then a succeeding pair (*flowering glumes*), rarely one of them wanting, these each inclosing a thinner scale or *palet*. Flower, when perfect, as it more commonly is, consisting of 3 stamens (rarely 1, 2, or 6), and a pistil, with 2 styles or a 2-cleft style, and 2 either hairy or plumose-branched stigmas; ovary 1-celled, 1-ovuled, becoming a *caryopsis* (the thin pericarp adnate to the seed and seeming to be an integral part of it); the floury part is the albumen of the seed, outside of which lies the embryo (Lessons, Figs. 66–70).

The real structure and arrangement of the flowers and spikelets of Grasses are too difficult and recondite for a beginner. For their study the Manual must be used; in which the genera both of this and the Sedge Family are illustrated by plates. Here is offered merely a short way of reaching the names of the commonest or most conspicuous species.

I. CEREAL GRAINS, *cultivated for the seed-like fruits.* (II., p. 468; III., p. 469; IV., p. 470; V., p. 471; VI., p. 473; VII., p. 475).

* *Stems hollow, or soon becoming so, making straw when cut.*

← *Spikelets in panicles, often crowded, but not so as to form a spike.*

Orỳza satìva, Linn. RICE. Cult. S., from Asia, in low grounds; 2°–4° high, with upper surface of the lance-linear leaves rough; flowers one and perfect in each spikelet, with or without rudiments of others; branches of the panicle erect; outer glumes minute, the inner coriaceous, very much flattened laterally, so as to be strongly boat-shaped or conduplicate, closing over the grain and falling with it, the outer one commonly bearing an awn; stamens 6. ①

Avèna satìva, Linn. Common Oat. From Old World; soft and smooth, with a loose panicle of large, drooping spikelets, the palets investing the grain; one flower with a long, twisted awn on the back, the other awnless; flowers 2 or 3 in the spikelet, perfect, or the uppermost rudimentary. ①

A. nùda, Linn. Naked Oat. Rarely cult., from Old World; has narrower, roughish leaves, 3 or 4 flowers in the spikelet, and grain loose in the palets. ①

+– +– Spikelets in strict spikes, or in such a dense panicle as to appear to be spicate.

++ Glumes 2 to each spikelet.

Tríticum satìvum, Lam. Wheat. Spike dense, somewhat 4-sided; the spikelets crowded, 4–5-flowered, turgid; glumes ventricose, blunt; palet either awned or awnless; grain free. Unknown wild. ①

Secàle cereàle, Linn. Rye. Tall; spike as in wheat; spikelets with only 2 perfect flowers; glumes a little distant, bristly towards the base; lower palet ventricose, long awned; grain brown. Probably from W. Asia. ①

++ ++ Glumes 6 at each joint, in front of the 3 spikelets, forming an involucre.

Hórdeum satìvum, Jessen. Common Barley. From the Old World; spike dense, the 3 spikelets at each joint of the rhachis all with a fertile flower, its lower palet long-awned. Originally from W. Asia. ①

H. dìstichon, Linn. Two-rowed Barley. From Tartary; evidently a cultivated state of the above; only one spikelet at each joint of the rhachis with a fertile flower, the two lateral spikelets being reduced to sterile rudiments; the flowers therefore two-rowed in the spike. ①

H. hexàstichon, Linn. Six-Rowed Barley. Another form of H. sativum, with roundish spikes, its joints very short and the flowers divergently 6-rowed. Not common.

** * Stems pithy and thick, not becoming hollow.*

Zèa Màys, Linn. Maize, Indian Corn. Stem terminated by the clustered, slender spikes of staminate flowers (the *tassel*) in 2-flowered spikelets; the pistillate flowers in a dense and many-rowed spike borne on a short axillary branch (the *ear*), two flowers within each pair of glumes, but the lower one neutral, the upper pistillate, with an extremely long style, the *silk*. Very many forms. Cent. and S. Amer. ① (Lessons, Figs. 66–70.)

II. Canes and Sorghums, *with pithy, solid stems. Cultivated for sugar or broom-making (occasionally for fodder). Spikelets clustered or scattered in an ample panicle, each with one perfect and one neutral or staminate flower.*

Sórghum vulgàre, Pers. (Andropógon Sórghum of some writers). Indian, Pearl or Black Millet. From Africa or India; a tall, maize-like plant without silky down in the spikelets; glumes coriaceous, russet-color. Var. cérnuum, Guinea Corn, has densely contracted panicle, and is cult. for the grain. Var. Dúrra, Doura, or Kaffir Corn, has densely contracted panicles. Var. saccharàtum, Common Sorghum, Chinese Sugar Cane, Imphee, &c., cult. for the syrup of the stem and for fodder; and Broom Corn, with open, long-rayed panicles, for the well-known corn brooms. ①

Sáccharum officinàrum, Linn. Sugar Cane. Cult. far S.; rarely left to flower, propagated by cuttings of the stem; stem 8°–20° high, 1′–2′ thick; long, white, silky down with the flowers. ♃

III. Meadow and Fodder Grasses. *Species of widely differing characteristics in the different parts of the country. Oat Grass (see V.) is sometimes grown in meadows, and Gama Grass (see VII.) is used for fodder.*

* *Flowers in loose panicles.*

+ *Spreading inveterately by creeping rootstocks.*

Sórghum Halapénse, Linn. (Andropògon arundinàceus). Johnson Grass. Guinea Grass (erroneously). A coarse grass, 4°–7° high, much prized for hay in the S.; leaves long, loose, and flat, with a prominent, white, raised midrib; panicle long and very open; the spikelets reddish and each bearing one or two awns. Old World. By some thought to be the parent of the Sorghums. 2

+ + *Not spreading widely by rootstocks.*

++ *Flower* 1 *in each spikelet and perfect, but sometimes rudiments of others.*

Agróstis álba, Linn. Fiorin or White Bent Grass. Stems with procumbent or creeping base; ligule long, acute, and conspicuous; panicle contracting after flowering, with roughish branches, greenish or slightly purplish; a valuable meadow grass. 2

Var. ***vulgàris***, Thurb. Redtop. Rather low (1°–2½°) and delicate grass of meadows and pastures, with oblong spreading panicle of small purple or purplish spikelets; ligule short and truncate. 2

Calamagróstis Canadénsis, Beauv. Blue Joint Grass. In all bogs N., and in reclaimed low meadows, much liked by cattle; 3°–5° high; resembles an Agrostis, but taller, and with a tuft of downy long hairs around the flower almost its length, the flowering glume with a delicate awn low down on its back and scarcely stouter than the surrounding down. 2

Pánicum miliàceum, Linn. True Millet. Spikelets all pedicellate in an umbel-form panicle, each with 3 empty glumes and 1 flower; tall grass (3°–4°) with loose, soft leaves and drooping panicle. Probably E. Indian. ①

++ ++ *Flowers several in each spikelet, most or all of them perfect.*

= *Panicle contracted in* 1*-sided clusters; glumes compressed on the sides and carinate.*

Dáctylis glomeràta, Linn. Orchard Grass. Nat. from Eu. in meadows and yards; a tall and coarse, but valuable grass for hay, etc., flourishes in shady places, 3° high; with broadly linear, rather rough, pale, and keeled leaves, and a dense panicle of one-sided clusters, on which the spikelets are much crowded, each 3–4-flowered, the glumes tapering into a short awn, rough-ciliate on the keel; flowers early summer. 2

= = *Panicle symmetrical, diffuse; glumes compressed and carinate and pubescent or cobwebby at the base in the Poas, but simply convex and glabrous in Festuca.*

Pòa seròtina, Ehrh. Fowl Meadow Grass, False Redtop. An important native grass in wet meadows N.; flowers in late summer in a loose panicle, the 2–4-flowered spikelets green with dull purple; flowering glume very obscurely nerved. 2

P. triviàlis, Linn. Roughish Meadow Grass. An introduced meadow and pasture grass, N.; flowering before midsummer, with open panicle of green spikelets, these mostly 3-flowered, the flowering glume prominently 5-nerved; sheaths and leaves roughish; ligule oblong, acute. A white-striped variety, is cult. for ornament. 2

P. praténsis, Linn. June Grass, Kentucky Blue Grass. Dry meadows and pastures, spreading by running rootstocks, and with a

panicle often purplish and more crowded than in the foregoing; flowering in earliest summer, the sheath smooth, and ligule short and blunt; flowering glume hairy along the margins and the 5 nerves. Makes the earliest hay. Very variable. 2

Festùca elàtior, Linn. TALL MEADOW FESCUE. A rather rigid grass of meadows and pastures, nat. from Eu.; 1°–4° high, with green flat leaves, a narrow panicle with short branches appressed before and after flowering, 5–10-flowered green spikelets, the flowering glume blunt, or acute, or rarely with a short awn. 2

* * *Flowers in densely contracted panicles and therefore seeming to be spicate.*

+ *Awn borne low down on the back of one or two palets.*

Anthoxánthum odorâtum, Linn. SWEET-SCENTED VERNAL GRASS. Nat. from Eu.; low, slender, soft and smooth; the pale brown or greenish spikelets crowded in an evident, spikelike panicle; each composed of a pair of thin, very unequal glumes, above and within these a pair of obcordate or 2-lobed, hairy, empty, flowering glumes, one with a bent awn from near its base, the other with a shorter awn higher up; above and within these a pair of very small, smooth and roundish palets, of parchment-like texture, inclosing 2 stamens and the 2-styled pistil, finally investing the grain. 2

Alopecùrus praténsis, Linn. MEADOW FOXTAIL. Introduced from Eu., abundantly into meadows E.; flowering in spring; stem about 2° high, bearing few pale soft leaves, terminated by a cylindrical soft and dense spike, or what seems to be so, for the spikelets are really borne on short side branches, not on the main axis; these spikelets very flat, contrary to the glumes, which are conduplicate, united by their edges towards the base, keeled, fringed-ciliate on the keel; these inclose a single conduplicate flowering glume (the upper one wholly wanting), which bears a long awn from below the middle of the back, and surrounds 3 stamens and the pistil. 2

+ + *Awn, if any, from the apex of the glumes or palets.*

Phlèum praténse, Linn. TIMOTHY, CAT-TAIL GRASS, HERD'S GRASS. introduced from Eu.; a coarse but most valuable meadow grass, 2°–4° high, with green roughish head, 3′–8′ long; spikelets densely crowded in a long, perfectly cylindrical, apparent spike, each spikelet strictly 1-flowered; glumes 2, keeled and nearly conduplicate, awn-pointed, much larger and of firmer texture than the thin and truncate awnless flowering glumes. 2

Setària Itálica, Kunth. HUNGARIAN GRASS, BENGAL GRASS. Cult. for fodder, 3°–5° high, with rather large leaves, a compound or interrupted so-called spike, which is evidently a contracted panicle, sometimes 6′–9′ long, and nodding when ripe; bristles short and few in a cluster; spikelets each with a single perfect flower, and by the side of it one or two thin palets of a sterile usually neutral flower. Often cult. as MILLET.

IV. LAWN AND PASTURE GRASSES. *The best and the commonest lawn grass North and East is June Grass or Kentucky Blue Grass, already described, and it is the commonest basis of old pastures. Redtop is also common in lawns and pastures, but it is generally run out after a time by June Grass. Sweet Vernal and Orchard Grass are often found in lawns. Other common lawn and pasture Grasses are the following:*

* *Flowers in open panicles.*

Agróstis canina, Linn. BROWN BENT, RHODE ISLAND BENT. A very dwarf fine grass, making a dense close sod upon poor soils; culms 8′–2° high; root leaves involute-bristle-form, but those of the culm flat;

panicle loose, brownish, rarely pale; glumes very acute, the flowering one awned on the back at or below the middle. 2

Festùca ovìna, Linn. Sheep's Fescue. Fine-leaved grass, ½°–2° high, tufted, with slender or involute pale leaves, 3–8-flowered spikelets in a short 1-sided panicle, open in flowering, contracted afterwards, the flowering glume rolled up, almost awl-shaped and tipped with a sharp point or bristle-like awn. 2

* * *Flowers in slender spikes, which are either solitary (in the first) or digitate.*

Lòlium perénne, Linn. Darnel, Rye Grass, Ray Grass. Introduced from Eu.; a good pasturage grass, 1°–2° high, with loose spike 5′–6′ long, of 12 or more about 7-flowered spikelets placed edgewise, so that one row of flowers is next the glume, the other next the zigzag rhachis; glume only one to the solitary spikelet, which stands edgewise; flowering glume short-awned or awnless. 2

Cýnodon Dáctylon, Pers. Bermuda or Scutch Grass. An introduced weed chiefly S., where it is useful in sandy soil, where a better grass is not to be had; creeping extensively, the rigid creeping stems with short flattish leaves, and sending up flowering shoots a few inches high, bearing 3–5 slender spikes; flower only one to each spikelet, and a mere rudiment beyond it, awnless. 2

* * * *Plant diœcious or monœcious; the staminate spikelets 2–3-flowered and sessile in 2 rows in 2–4 short, 1-sided, pedunculate spikes; fertile spikelets 1-flowered, in a pair of 1-sided, capitate clusters, sessile in the sheaths of the upper leaves.*

Bùchloë dactyloìdes, Engelm. Buffalo Grass. Low and tufted, less than 4′–8′ high; sterile spikes less than ½′ long; male plant taller than the female. Plains W. of the Miss., where it is a leading pasture grass.

V. Weedy and Introduced Grasses, *mostly in cultivated lands or about waste places, not cultivated.*

* *Flowers in an open panicle.*

+– *Spikelets large, drooping when mature.*

Bròmus, Brome Grass. Spikelets large, at length drooping in an open panicle; containing 5–10 or more flowers, the flowering glume with a short bristle point or an awn from the blunt, rounded tip or notch, the palet soon adhering to the grain. Coarse grasses; 2 or 3 wild species are common, and the following are weeds of cultivation, from Eu. The first three have flowers imbricated over each other, the spikelets therefore rather dense. The last three have loose spikelets, the flowers soon separating from one another.

B. secálinus, Linn. Common Chess, Cheat. Well known in wheat-fields, and once thought to be a degenerated form of wheat; nearly smooth; panicle open and spreading, even in fruit; spikelets turgid; flowers laid broadly over each other in the two ranks; flowering glume convex on the back, concave within, awnless or short-awned. ① ②

B. racemòsus, Linn. Upright Chess. Like the other, but with narrower erect panicle contracted in fruit, flowering glume slender-awned, and sheaths sometimes hairy. ① ②

B. móllis, Linn. Soft Chess. Like the preceding, but soft-downy, with denser conical-ovate spikelets, and the long-awned glume acute. ① ②

B. ásper, Linn. Culm slender and panicle small; spikelets loosely 5–9-flowered; the flowers oblong or lanceolate; glume linear-lanceolate, scarcely keeled, and hairy near the margins, rather longer than the awn; sheaths and lower leaves downy or hairy. 2

B. stérilis, Linn. Leaves rather downy, but the culm glabrous; panicle open; the spikelets on long, nearly straight, and simple peduncles; the slender, awl-like flowers 5–9, and 7-nerved, and roughish; the awn 1′ long. Not yet common. ① ②

B. tectòrum, Linn. More common than the last; panicle lax and somewhat 1-sided; the spikelets pubescent and more numerous, on very slender, curving pedicels; leaves short. ① ②

+ + *Spikelets of ordinary or small size, spreading or erect.*

= *Flowers not awned.*

Pòa. Meadow Grass. Several common species; known by the open panicle of 3–10-flowered spikelets; the glumes and flowering glumes blunt (no awn nor pointed tip), the latter laterally compressed and boat-shaped, with scarious or white, membranaceous edges, and usually some delicate, cobwebby hairs towards the base. The commonest is June Grass, already mentioned, which is sometimes a weed. The only other weedy ones are:

P. ánnua, Linn. Low Spear Grass. Very low, weedy grass in cult. ground, waste places, paths, etc. Flowers in spring or again in summer. Eu. ①

P. compréssa, Linn. Wire Grass, English Blue Grass. In cultivated soil, often a very bad intruder; pale, with low, very flat stems, rising obliquely from a creeping base; panicle small. Eu. 2

Pánicum capillàre, Linn. Tumble Grass, Old Witch Grass. A diffuse plant, common in cornfields and other cultivated grounds, and rolling before the wind in the fall; sheaths, and usually the leaves, hairy; panicle very compound, with long, capillary divisions; spikelet with 1 perfect flower, the lower glume half the length of the upper empty one. ①

= = *Flowers with a bent or twisted awn.*

‖ *One flower perfect, and one staminate only.*

Arrenathèrum avenàceum, Beauv. Oat Grass, Grass of the Andes. Rather coarse but soft grass, introduced from Eu. into meadows and fields; thin and very unequal glumes, including a staminate flower, the lower glume of which bears a long, bent awn below its middle; above this a perfect flower with its glume bristle-pointed from near the tip, and above that a rudiment of a third flower. Sometimes grown as a meadow grass, S. and W. 2

Hólcus lanàtus, Linn. Velvet Grass, Meadow Soft Grass. Introduced from Eu. into meadows and yards, not very common, 1½°–2° high, well distinguished by its paleness and velvety softness, being soft downy all over; panicle crowded; the flowers only 2 in the spikelet, small, rather distant, the lower one perfect and awnless, the upper staminate and with a curved or hooked awn below the tip. 2

‖ ‖ *Flowers several (about 7) in the spikelet.*

Danthònia spicàta, Beauv. Poverty Grass. A thin, wild grass, 1°–2° high, growing in sterile soils; spikelets few and whitish, subspicate; flowering glume loosely hairy, with stout and pointless teeth, between which arises a conspicuous awn; tufted, with very narrow leaves. 2

* * *Flowers in spikes or dense spike-like panicles.* (For Bermuda Grass, see IV.)

+ *Spikelets strictly spiked, all on one side of a flattened, jointless rhachis, much crowded; the 2–5 spikes digitate, i.e. all on the apex of the flowering stem.* Finger Grass *might be sought here; see* Panicum, *next page.*

Elusine Índica, Gærtn. Crab Grass, Yard Grass, Dog's-tail Grass, or Wire Grass. Introduced only in yards or lawns N., more abundant S., where it is valuable for cattle; low, spreading pale; flowers 3–5 or more

in each spikelet, the uppermost generally imperfect; seed loose, proportionally large, rough-wrinkled; glumes and palets pointless. ①

E. Ægyptìaca, Pers. Egyptian Grass. Yards and fields, chiefly a weed, S.; creeping over the ground, low; spikes dense and thickish; glumes flattened laterally and keeled, one of them awn-pointed, the lower one awned. Both from the Old World.

Agropỳrum rèpens, Beauv. Couch, Quack, Quitch, or Quick Grass. Spreads amazingly by its vigorous, long, running rootstocks, is a pest in cultivated fields, and is too coarse and hard for a meadow grass; 2°–3° high; many forms, introduced from Eu.; spikelets 4–8-flowered; flowering glume either pointless or short-awned; glumes a pair to the single spikelet, right and left at each joint of the rhachis. 2

+– +– *Spikelets in a contracted panicle or seeming spike, or if spiked somewhat on one side of the rhachis; each with a single, perfect flower, its palets of coriaceous or cartilaginous texture; by the side of it are either one or two thin glumes of a sterile, usually neutral flower.*

+– +– *One or many slender bristles at the base of each spikelet.*

Setària glaùca, Beauv. Foxtail, Pigeon Grass. In stubble and cultivated grounds, low; spike tawny yellow, dense; long bristles 6–11 in a cluster, rough upwards; perfect flower wrinkled crosswise. Eu. ①

S. víridis, Beauv. Green Foxtail, Bottle Grass. Has less dense and greener spike, fewer bristles, rough upwards, and perfect flower striate lengthwise. Eu. Common. ① Thought by some to be the parent of Hungarian Grass (see III.).

S. verticillàta, Beauv. Spike cylindrical and pale green, with apparently whorled spikelets or clusters; bristles single or in pairs and rough downwards. Eu. Not common. ①

+– +– +– *No bristles at the base of the spikelets.*

Pánicum sanguinàle, Linn. Finger Grass or Crab Grass. Chiefly a weed in cult. fields and about yards in late summer and autumn, but useful in thin grounds S. for hay; herbage reddish; spikes 4–15, slender, digitate, nearly 1-sided; spikelets seemingly 1-flowered, the upper empty glume half the length of the flower, the lower one small; Eu. ①

P. glàbrum, Gaudin. More prostrate and lower; spikes 2–6, widely spreading; upper empty glume equaling the flower, but the lower one almost wanting. Waste lands, commonest S. Eu. ①

P. Crus-gálli, Linn. Cock'sfoot, Barnyard Grass. Common, weedy grass of barnyards and low, rich grounds; coarse, with rather broad leaves, and numerous, seeming spikes along the naked summit of the flowering stems, often forming a sort of panicle; spikelets with one fertile and one sterile flower, the glume of the latter bearing a rough awn. Eu. ①

Phálaris Canariénsis, Linn. Canary Grass. Cult. from Eu. for canary seed, and running wild in some waste places; 1°–2° high, with the panicle contracted into a sort of oblong spike; the glumes with wing-like keels; and a little scale or rudimentary, sterile flower at the base. ①

+– +– +– *Spikelets* 1–5, *inclosed in a globular and spiny bur or involucre.*

Cénchrus tribuloìdes, Linn. Bur Grass, Hedgehog Grass. A low, spreading grass along the seashore and Great Lakes, and in sandy places; spike composed of 8–20 spherical, prickly heads or burs which detach easily and adhere to clothing. ①

VI. Ornamental Grasses, *regularly cultivated in gardens.*

* *Annual (or biennial) grasses grown for use in dried flower bouquets, or one cult. for curiosity.* (*Feather Grass, in* * * * *may be sought here.*)

+– *Spikelets compact and mostly large, oblong or ovate-shaped, hanging.*

Bròmus unioloìdes, HBK. (Ceratóchloa péndula). Rather stout

and broad-leaved, with drooping, large, 6–10-flowered spikelets much flattened laterally, so that the lower glumes are almost conduplicate and keeled on the back; awns very short. ♃ Trop. Amer. and W. United States; has been recommended for fodder S.

B. brizæfórmis, Fisch. & Mey. Elegant grass, in clumps; 2° high, with many large, drooping, oblong-ovate, silvery-yellow, 12–30-flowered spikelets; awns 0; lower sheaths and often the short leaves hairy. Caucasus.

Brìza máxima, Linn. Large Quaking Grass or Rattlesnake Grass. A low grass, with the hanging, ovate-heart-shaped, 12–20-flowered spikelets somewhat like those of Bromus, but pointless, very tumid, purplish, becoming dry and papery, rattling in the wind, — whence the common name; awns 0. Eu.

B. mìnor, Linn. (B. gracilis). Little Quaking Grass. Smaller, with triangular-ovate spikelets, which are about 7-flowered; glumes longer than the flowers. Very delicate and pretty. Eu. and Asia.

+ + Spikelets large, but loose, oat-like.

Avèna stérilis, Linn. Animated Oat. Sometimes grown for the curious movements of the ripe florets due to the hygroscopic action of the profuse covering of hairs; panicle very large; the spikelets about twice the size of those of the Common Oat. Eu.

+ + + Singular grass, with imperfect flowers; the perfect one (with 1 or 2 sterile ones) borne inside a seed-like, pearly, flask-shaped pouch formed by the sheath of a leaf; sterile inflorescence projecting from the flask.

Coìx Lácryma-Jòbi, Linn. Job's Tears, Tear Grass. Plant 2°–4° high, grown for the ornamental clusters of so-called "seeds" (these sometimes used for rosaries), which are as large as a cherry stone, shining and whitish. India and China.

** * Diffuse, half-creeping perennial grass with small simple panicles, grown in conservatories.*

Oplísmenus Burmánni, Pal. (Pánicum variegàtum of florists). Slender and spreading plants grown in pots, hanging baskets and under benches, known by its spreading, narrow-lanceolate, long-pointed leaves (2′–4′ long), which are more or less perfectly 2-ranked and in the common form neatly striped with white and pink after the manner of the Wandering Jew. Recalls depauperate forms of Barnyard Grass. Tropical Asia.

** * * Tall perennial grasses, grown for lawn decoration.*

+ Panicle very silky-hairy, the hairs on the rhachis or in the flower.

Miscánthus Sinénsis, Anders. (Eulàlia Japónica and varieties). Zebra Grass. A stately grass from Japan, the forms with leaves striped or banded (Eulàlia zebrìna, etc., of nurserymen) with yellow, now the most common; 4°–9° high, with long slender leaves, and a rather small erect panicle late in the season; spikelets 1-flowered, stamens 3, flowering glumes more or less bifid, and awned between the teeth.

Gynèrium argénteum, Nees. Pampas Grass. Tall, reed-like grass, from S. Amer., with a large tuft of rigid linear and tapering recurved-spreading leaves, several feet in length; the flowering stem 6 to 12 feet high and overtopping the leaves in autumn, bearing an ample silvery-silky panicle; spikelets loosely 2–∞-flowered.

Eriánthus Ravénnæ, Beauv. Plume Grass. Stems 5°–10° high, bearing plume-like, violet or brownish, silky panicles 1°–2° long; leaves for the most part in a clump at the base of the stems; spikelets awned, with one perfect flower; rhachis of the branches of the panicle jointed. S. Eu.

Arúndo Dònax, Linn. 8°–20° high, grown for its stately habit (and the striped leaves of one variety); leaves comparatively short, broad and flat,

alternate and sheathing on the Maize-like stem; spikelets 3–4-flowered, all perfect; glume bifid; axes of the spikelets naked, but the flowers furnished with long hairs. S. Eu. Seldom flowers in N. States.

+ + Long plumose awns from the empty glumes; spikelets 1-flowered.

Stipa pennàta, Linn. Feather Grass. Plant 2°–3° high, bearing long, slender, often drooping, feather-like panicles; awns twisted, 8–10 times longer than the glumes. Eu. Sometimes used for bouquets.

+ + + Spikes not silky-hairy nor plumose.

Phálaris arundinàcea, Linn. Reed Canary Grass (the striped variety is the familiar Ribbon Grass of country gardens). Bogs and low grounds; 2°–4° high, with flat leaves nearly ½′ wide, flowering in early summer, in a pretty, dense, contracted panicle, but open when the blossoms expand; the ovate outer whitish glumes longer and much thinner than the blunt coriaceous flowering glumes; a hairy rudiment or appendage at the base of each of the latter.

VII. Wild Grasses, *which are distinguished for tall reed-like growth.*

** Stems pithy, not hollow.*

Trípsacum dactyloìdes, Linn. Gama Grass, Sesame Grass. Moist soil, Conn., S.; nutritious, but coarse; leaves almost as large as those of Indian corn; spike (the upper part staminate, the lower pistillate) narrow, composed of a row of joints which break apart at maturity; the fertile cylindrical, the externally cartilaginous spikelets immersed in the rhachis, the sterile part thinner and flat. Sometimes used for fodder S.

** * Stems hollow at maturity.*

+ Flowers monœcious, staminate and pistillate separate in the panicle.

Zizània aquática, Linn. Indian Rice or Water Oats. In water, commonest N. W.; with leaves almost as long as those of Indian Corn, the upper part of the ample panicle bearing pistillate flowers on erect, club-shaped pedicels, the lower bearing staminate flowers on spreading branches; each flower or spikelet with only one pair of glumes, the outer one long-awned; grain slender, ½′ long, used for food by N. W. Indians. ①

+ + Flower one and perfect in each spikelet, but sometimes with rudiments of others.

Ammóphila arundinàcea, Host. Sea-sand Reed. Beaches, Me., S., and on the Great Lakes, where it serves a useful purpose in binding the sand by its rootstocks; has the panicle contracted into a long spike-like inflorescence; leaves long and strong; spikelets pale, rather rigid, the hairs at the base of the flowers, two thirds shorter than they. 2ℓ

Phálaris arundinàcea, Linn. The wild form may be sought here (see VI.).

+ + + Flowers several in each spikelet, all or nearly all perfect.

Phragmìtes commùnis, Trin. Common Reed. Noble grass, in marshes; 5°–12° high, with leaves 1′–2′ wide, the stems dying down to the base; panicle in late summer or autumn, loose; spikelets 3–7-flowered, beset with white, silky, long hairs. 2ℓ

Arundinària macrospérma, Michx. Large Cane. Forming the cane brakes, Ky., S.; with woody stems 10°–20° high and leaves 1′–2′ wide, branching the second year, at length flowering from the branches, in February or March; the panicle of a few small racemes of large many-flowered naked spikelets, the flowering glume usually downy. 2ℓ

Var. **suffruticòsa**, Munro. Smaller Reed, Switch Cane. Only 4°–10° high, and more branching; leaves narrower. Md., W. and S.

Class II. GYMNOSPERMS.

Plants with no closed ovary, style, or stigma, but ovules and seeds naked on a scale or some other sort of transformed leaf, or in Yew at the end of a scaly-bracted stalk; the mouth of the ovule receiving the pollen directly. Leaves not netted-veined. Cotyledons often more than 2. (Lessons, Figs. 56, 57, 337–339, 411–413.)

CXXXV. CONIFERÆ, PINE FAMILY.

Trees or shrubs, with wood of homogeneous fiber (no ducts), resinous juice, commonly needle-shaped or awl-shaped leaves (mostly evergreen), and monœcious or sometimes dicœcious flowers destitute of both calyx and corolla, and in catkins, or the like.

Aside from the species here described, there are the following, amongst others, in cultivation: Araucàrias, particularly A. imbricàta, Pav., the Monkey Puzzle, from Peru, with ovate-lanceolate, pointed, stiff, keeled leaves, grown under glass, and in the open S.; Sciadópitys verticillàta, Sieb. & Zucc., Parasol Tree, from Japan, grown out of doors, with long, linear, verticillate leaves; Cephalotáxus drupàcea, Sieb. & Zucc. (known also as C. Fortùni), a straggling shrub planted from Japan in the middle and southern states with dicœcious, flat, linear, 2-rowed leaves, and a drupe-like fruit the size of a small plum which ripens the second year.

I. PINE SUBFAMILY, proper. These are true *Coniferæ*, or cone-bearing trees, the fertile flowers being in a scaly catkin which becomes a strobile or scaly cone. The scales are each in the axil of a bract (which is sometimes evident and projecting, but often concealed in the full-grown cone), and bear a pair of ovules adhering to their inner face next the base, the orifice downwards, and the 2-winged seeds peel off the scale as the latter expands at maturity. They all have scaly buds. Leaves scattered or fascicled.

* *Cones maturing the second year, and the scales becoming thick and corky.*

1. PINUS. Leaves persistent, long and needle-shaped, 2, 3, or 5 in a cluster from the axil of dry bud scales, developed after the scaly shoot of the season lengthens. Sterile catkins clustered at the base of the shoot of the season; each stamen answers to a flower, reduced to a 2-celled anther, with hardly any filament. Cone woody, mostly large, maturing in the autumn of the second year. Cotyledons of the embryo several. (See Lessons, Figs. 56, 57, 184, 185, 411–413.)

* * *Cones maturing the first year (except in No. 6), the scales remaining thin.*

\+ *Leaves persistent; i.e., evergreen.*

\+\+ *With cones pendulous or reflexed, their scales persistent.*

2. PICEA. Cones terminal. Sterile flowers mostly axillary (sometimes terminal), on branchlets of the preceding year. Leaves needle-shaped and 4-angled, sessile, scattered or spirally disposed.

3. TSUGA. Cones on the ends of last year's branchlets. Sterile flowers in a sub-globose cluster springing from the axils of last year's leaves. Leaves short, flat and whitened beneath, short-petioled, 2-ranked.

4. PSEUDOTSUGA. Cones large, the bracts more or less exserted and spreading or reflexed, causing the cones to appear fringed. Leaves flat, short-petioled, 2-ranked.

\+\+ \+\+ *With cones erect, the scales at length deciduous.*

5. ABIES. Cones on the upper side of spreading branches, the bracts mostly exserted. Sterile flowers from the axils of last year's leaves. Leaves flat, whitened, and with the midrib prominent beneath, sessile, scattered, but appearing 2-ranked on horizontal branches.

6. CEDRUS. Leaves as in Larix, but rigid and persistent. Cones globular, large, of very broad thin scales.

\+ \+ *Leaves deciduous.*

7. LARIX. Leaves all falling in autumn, soft, short-needle-shaped, in spring, developed very many in a dense cluster from axillary buds of the previous summer, those on shoots of the season similar but scattered. Cones as in Abies, the scales persistent. (Lessons, Figs. 184, 337.)

II. CYPRESS SUBFAMILY. These have both kinds of flowers in short, often globular, catkins of few scales; the fertile making a globular or ovate, small cone, which is often fleshy when young, sometimes imitating a berry. The branches appear and the shoots grow on without the intervention of any scaly buds. Leaves often opposite or whorled, sometimes scale-like and adnate to the branch.

* *Scales of the globular cone with a pointed bract behind each wedge-shaped scale, partly cohering with its back.*

8. CRYPTOMERIA. Cone terminating a leafy branch, the recurved tip of the bract and awl-shaped lobes of the top of the scales projecting.

* * *Scales of the fruit simple, no bract behind them.*

\+ *Fruit a sort of cone, dry and hard when mature; flowers monœcious, rarely diœcious.*

\+\+ *Leaves deciduous, thin and delicate, flat.*

9. TAXODIUM. Two kinds of flowers on the same branches; the sterile catkin spike-panicled, of few stamens; the fertile in small clusters. Cone globular, firmly closed till mature, of several very thick-topped and angular shield-shaped scales, a pair of erect 3-angled seeds on their stalk.

\+\+ \+\+ *Leaves evergreen, linear and awl-shaped, alternate, free, destitute of glands.*

10. SEQUOIA. Catkins globular, the scales of the fertile ones bearing several ovules. Cone woody; the shield-shaped scales closed without overlapping, and bearing 3–5 flat wing-margined seeds hanging from the upper part of their stalk-like base.

++ ++ ++ *Leaves evergreen, opposite, awl shaped and scale shaped (the former on the more vigorous lengthening shoots, the latter closely imbricated and decussate on the succeeding branchlets), commonly with a resinous gland on the back. Seeds and ovules erect; cotyledons only* 2 *or* 3.

11. CUPRESSUS. Cones spherical; the shield-shaped scales closing by their well-fitted margins, not overlapping, separating at maturity, each scale bearing many ovules and narrowly-winged seeds, its broad summit with a central boss or short point.
12. CHAMÆCYPARIS. Cone globose, terminal, firmly closed, but opening at maturity, the scales peltate. Sterile flowers composed of shield-shaped, scale-like filaments bearing 2–4 anther cells. Leaves small and scale-like, appressed or spreading. Seeds 2–3 below each scale, in which it differs chiefly from Cupressus.
13. THUJA. Cones oblong or globular, the scales not shield-shaped, but concave and fixed by their base, overlapping in pairs, pointed if at all from or near their summit, spreading open at maturity, each bearing a single pair of ovules and winged seeds. (Lessons, Figs. 338, 339.)

+ + *Fruit berry-like; flowers commonly diœcious.*

14. JUNIPERUS. Catkins very small, lateral; the fertile catkin of 3–6 fleshy scales growing together, and ripening into a sort of globular berry, containing 1–3 bony seeds. Leaves evergreen, opposite or whorled.

III. YEW SUBFAMILY. Distinguished by having the fertile catkin, if it may be so called, reduced to a single, terminal flower, consisting of an ovule only, surrounded by some bracts or a fleshy disk, ripening into a nut-like or drupe-like seed; cotyledons only 2. There is nothing answering to the scales of a pine cone. Leaf buds scaly as in the true Pine Family. Flowers mostly diœcious, axillary.

15. TAXUS. Leaves linear, appearing more or less 2-ranked, green both sides. Both kinds of catkins, if such they may be called, are small axillary buds imbricated with persistent scales, bearing at the apex, one a few naked stamens each with 3–8 anther cells under a somewhat shield-shaped apex, the other an ovate ovule. This in fruit becomes a nut-like blackish seed, resting in the bottom of a berry-like red cup.
16. TORREYA. Leaves, catkins, etc., nearly as in Taxus. Stamens more scale-shaped at top, each bearing 4 hanging anther cells. Naked seed resembling a thin-fleshed drupe or when dry a nut, with no cup around it, as large as a nutmeg, which it resembles also in the brain-like interior structure.
17. GINKGO. Leaves wedge-shaped and fan-shaped, deeply 2-cleft and the lobes wavy-toothed and somewhat cleft at the broad truncate end, traversed with straight simple or forking nerves or veins, like a Fern. Flowers not often seen. Sterile catkins slender and loose. Seed drupe-like, and with a fleshy short cup around its base.
18. PODOCARPUS. The fleshy seed raised on a sort of stalk. Leaves sometimes much unlike those of other Coniferous trees, being large, linear, lanceolate, or even ovate, and veinless, except the midrib.

1. PÌNUS, PINE. (The classical Latin name.) Flowers in late spring.

* White Pines, *with soft leaves* 5 *in the cluster, their sheath and the scale underneath early deciduous; cones long, cylindrical, terminal, hanging, falling after shedding the seeds, their scales hardly if at all thickened at the end, pointless; seed thin-shelled and winged.*

P. Strôbus, Linn. White Pine. Tall tree mostly in poor soil, Penn., N., and along the mountains to Ga.; with soft, white wood invalu-

able for lumber, smooth, greenish bark on young trunks and branches; pale or glaucous, slender leaves 3′–4′ long; and narrow cones 5′–6′ long.

P. excélsa, Wall. Bhotan or Himalayan White P. Ornamental tree barely hardy far N.; with the drooping and glaucous-green, slender leaves and the cones nearly twice the length of those of White Pine; cone 6′–10′ long, with large, wedge-like, loosely imbricated scales.

* * Nut Pines, *with leaves, etc., as in the preceding section, but short, thick cones of fewer and thick, pointless scales, and large, hard-shelled, edible seeds destitute of a wing.*

P. Cémbra, Linn. Cembra or Swiss Stone P. of the higher Alps; small, slow-growing, very hardy, ornamental tree, with green, 4-sided leaves 3′–4′ long and much crowded on the erect branches; cones round-oval, erect, 2′ long; the round seeds as large as peas.

* * * Pitch Pines *and their relatives, with leaves only* 2 *or* 3 *in the cluster, scaly-sheathed at the base; wood resinous.*

+– *Leaves* 3 *in the cluster. All natives, but the last Californian.*

+– + *Cones terminal; leaves long and slender.*

P. palústris, Mill. Long-leaved or Southern Yellow Pine. Lofty, striking tree of pine barrens from S. Va., S.; with leaves 10′–15′ long, very resinous wood, and cones 6′–10′ long; the scales tipped with a reflexed, short spine.

+– + *Cones lateral and persistent on the branch long after shedding the seed; the scales thickened at the end, often tipped with a cusp or spine; leaves rigid.*

P. Tæda, Linn. Loblolly or Old-field P. Small tree, in light soil, from Del., S., with less resinous wood than the last; dark-green leaves 6′–10′ long; and solitary cones 3′–5′ long; the scales tipped with a short, straight, or incurved spine.

P. rígida, Mill. Northern Pitch P. Sandy or thin, rocky soil, abounding along the coast N. and in the upper country S.; a stout tree, with dark-green leaves 3′–5′ long from short sheaths; clustered, ovate-conical cones 2′–3′ long; the scales tipped with a recurved spine or prickle. (Lessons, Figs. 411–413.)

P. serótina, Michx. Pond P. Small tree in wet ground from N. Car., S.; with valueless wood; leaves 4′–8′ long, and mostly opposite, round-ovate cones 2′–3′ long, their scales tipped with a very small and weak prickle.

P. ponderòsa, Dougl. Planted from Cal., where it is a characteristic tree, with heavy wood, deep-green leaves 6′–11′ long, and clustered cones about 3′ long, reflexed on a short stalk.

+– + *Leaves only* 2 *in the sheath* (Lessons, Fig. 185), *or a few of them sometimes in threes, mostly differ.*

+– + *Scales of the cone tipped with a distinct beak or prickle, often recurved.*

P. sylvéstris, Linn. Scotch Pine (wrongly called also *Scotch Fir*). The common Pine of N. Eu.; middle-sized tree, known by the bluish-white hue of its flat leaves (2′–4′ long), reddish bark on the trunk, and narrow, tapering cones; the scales with tubercle-like tips. Common in cultivation.

P. montàna, Du Roi. The dwarf Mugho Pine, or P. Mugho of nurseries, is a native of S. Eu.; usually a spreading shrub or bushy tree, 2°–10° high, with stiff leaves 2′–3′ long, and smallish, tapering cones with slight points to the scales.

P. púngens, Michx. f. Table Mountain or Prickly Pine. Along the Alleghanies from Penn. to S. Car.; middle-sized tree, with dark bluish-green leaves only about 2′ long; but the heavy and clustered, ovate cones fully 3′ long, the scales being armed with a very strong, somewhat hooked spine.

P. ínops, Ait. Jersey Scrub P. Low, straggling tree of barrens and sterile hills, from Long Island, S. and W., with drooping branchlets; leaves 1′–3′ long; solitary ovate-oblong cones 2′ long, reflexed on a short stalk; the scales tipped with an awl-shaped prickle.

P. mìtis, Michx. Yellow Pine, Short-leaved Yellow Pine. A middle-sized tree in sandy or dry soil, with firm, fine-grained wood, slender leaves (not rarely in threes) 3′–5′ long; and mostly solitary, ovate, or oblong-conical cones barely 2′ long; the scales tipped with a minute, weak prickle. Staten Island, W. and S.

†† †† *Scales of the cone not beaked, but often wrinkled or uneven.*

P. Austrìaca, Höss. Austrian P. A probable variety of P. Larício, or Corsican P. of S. Eu.; a fast-growing, massive tree, with very rough branches; dark-green, slender, but rigid leaves, 4′–6′ long; and conical cones 2½′–3′ long. Commonly planted.

P. Massoniàna, Lamb. China, now frequently cultivated, particularly the form with party-colored white and green leaves, which are 5′–7′ long and slender; cones very small, solitary, or 2–3-verticillate.

P. Banksiàna, Lamb. Gray or Northern Scrub P. Jack P. Along our northern frontiers and extending N., on rocky banks; straggling shrub or tree, 5°–20° high, with oblique or contorted leaves 1′ long; curved cones barely 2′ long persisting on the branches several years; blunt scales.

P. resinòsa, Ait. Red Pine, Norway Pine. The Latin name not a good one, as the tree is not especially resinous; dry woods N. from N. Eng. to Minn.; 50°–80° high, with reddish and smoothish bark, compact wood, dark-green leaves 5′–6′ long and not rigid; and ovate-conical, smooth cones about 2′ long, at the apex of the branch and falling after shedding the seed, their scales slightly thickened at the end and without any prickly point. Much used for lumber in Mich. and W.

2. PÌCEA, SPRUCE. (Latin name.)

* *Foliage distinctly glaucous, so that the tree has a whitish or bluish cast. (Leaves glaucous both above and below.)*

P. púngens, Engelm. Colorado Blue Spruce. Of conical, slow growth, with spreading, horizontal branches; branchlets smooth and shining; leaves 1′ or less long, very sharp-pointed, stiff, in the best forms densely glaucous-blue (varies into almost green forms); cones solitary or clustered, cylindrical, 2½′–5′ long. Rocky Mountains.

P. álba, Link. White Spruce. Along our northern borders and N.; when planted a very handsome tree, with pale, glaucous leaves; cylindrical, nodding cones about 2′ long, falling the first winter; the thinner scales with a firm, even edge.

* * *Foliage green or nearly so (leaves glaucous, if at all, only on the under side).*

† *Cones 4′ or less long.*

P. nìgra, Link. Black or Double Spruce. Cold woods and swamps N. and along the mountains S.; middle-sized tree, with leaves (seldom over ½′ long) dark-green (a glaucous-whitish variety E.); its ovate cones recurving on short branches, 1′–1½′ long, persistent for several years; thin, rigid scales with thin, often eroded edge.

P. Alcockiàna, Carr. Leaves rigid and more or less curved, distinctly 4-sided, but flattened, sharp-pointed, slightly glaucous on the two under sides; cones oblong and tapering at both ends, 2′–3′ long; the scales brown, shining, and striate, and minutely toothed. A tree of close, graceful habit, planted from Japan. Confounded with ***P. Ajanénsis***, Fischer, also of Japan and Northeast Asia, which differs in having flat leaves which are glaucous-blue beneath, the scales of the cones less rounded and more deeply toothed, and the branches more rigid.

P. polìta, Carr. Tree of conical growth and projecting branchlets, these latter very rigid and cream-yellow; leaves on all sides of the branches short, erect, and rigid, slightly falcate, very sharp-pointed, 4-sided, with the faces slightly hollowed; cones ellipsoidal, 3′–4′ long; the coriaceous scales light-brown and minutely notched. Japan.

P. orientàlis, Carr. Handsome tree with very slender branches and retaining its lower branches next the ground; leaves close-set upon all sides of the branchlets and deep, glossy green, stiff, not sharp; cones somewhat cylindrical, 2–3′ long, pointed at the top. Caucasus. Not fully hardy in Northern States.

\+ + *Cones 5–7′ long.*

P. excélsa, Link. Norway Spruce. The most common and most vigorous species, planted from Eu.; fine, large tree, with stout branches, deep-green leaves larger than in the next, the mature hanging cones light colored and very conspicuous. Runs into numerous horticultural varieties, some of the dwarf ones growing only 3°–5° high.

3. TSÙGA, HEMLOCK SPRUCE. (Japanese name.)

T. Canadénsis, Carr. Hemlock. Common forest tree on hills and in swamps N., and planted for ornament; large tree, with coarse wood, light and spreading spray, broadish-linear and blunt leaves only ½′ long, green above and whitish beneath, and oval cones only ½′ or ¾′ long, their bracts very short and hidden. There are several cultivated varieties.

4. PSEUDOTSÙGA, DOUGLAS SPRUCE. (*False Tsuga.*)

P. Douglásii, Carr. One of the tall trees from Rocky Mountains and W. to the Pacific, planted in two or three forms; slender leaves 1′ or more long, light green, indistinctly 2-ranked; cones 2′–3′ long, loose, with pointed and toothed bracts projecting beyond the scales.

5. ÀBIES, FIR. (Classical Latin name. — The names Abies and Pìcea, for Fir and Spruce, are just oppositely used by different authors. Linnæus employed the former for Spruce, the latter for Fir, and so do some late writers. The ancients used the names just the other way, and the later botanists mostly follow them.) Flowers late spring.

* Balsam Firs, *native trees; bark yielding Canada balsam from blisters, etc.*

A. balsàmea, Miller. Common B. Small tree of cold or wet grounds N.; handsome when young, but soon becoming ragged, with poor wood, narrow linear leaves ¾′ or less than 1′ long and much crowded, cylindrical violet-colored cones 2′–4′ long and 1′ thick, their bracts with only the abrupt slender point projecting.

A. Fràseri, Lindl. Fraser's or Southern B. Along the higher Alleghanies, N. Car., S.; small tree, like the preceding; but the small cones (only 1′–2′ long) oblong-ovate, with the short-pointed upper part of the bracts conspicuously projecting and reflexed.

* * Silver Firs, *very choice ornamental exotic trees.*

+– *Leaves blunt.*

A. pectinàta, DC. European Silver Fir. Large tree having slender horizontal branches with narrow leaves (greener above than in Balsam F., nearly as white beneath, and $1\frac{1}{4}'$ long) forming a flat spray; cones 6′–8′ long, cylindrical, with slender projecting points to the bracts.

A. Nordmanniàna, Spach. Caucasus; with thicker-set and broader, more glossy leaves than the foregoing, linear, curved, 1′ long, deep green above and whitened beneath; cones large and ovate (5′–6′ long); branches rigid and horizontal, very leafy.

A. Sibírica, Ledeb. (A. Píchta). Siberian Silver F. With thicker-set leaves than those of European Silver Fir, dark-green above and less white beneath; cones only 3′ long, their short bracts concealed under the scales.

+– +– *Leaves acute or pointed, especially on main shoots, rigid, widely and about equally spreading on both sides.*

A. Cephalónica, Link. Cephalonian Silver Fir. Remarkable for its very stiff, almost prickly-pointed, squarrose, close-set leaves, dark-green above, white beneath; cones 5′–6′ long, like those of A. pectinata. Greece, etc.

A. Pinsàpo, Boiss. Spanish Silver Fir. Resembles the last, but not so hardy, with leaves less pointed, and the bracts of the cones concealed; cones cylindrical, 4′–5′ long. Spain.

6. CÈDRUS, CEDAR, i.e. of Lebanon. (Ancient Greek name.) Wood reddish, fragrant. Cult. for ornament, but precarious in this climate.

C. Líbani, Barrel. Cedar of Lebanon. With dark foliage and stiff horizontal branches, the terminal shoot erect; cones 3′–4′ long, peduncled, oblong-oval, maturing the second (or third?) year; not hardy.

C. Deodàra, Loud. Deodar C. Of Himalayas; with lighter drooping spray on young trees, and larger whitish leaves. Somewhat planted S.; now considered to be only a form of the first.

7. LÀRIX, LARCH. (The ancient name.) Trees planted for ornament and valuable for timber; branches slender, the young ones pendulous; flowers in earliest spring, much before the leaves appear; catkins from lateral spurs or broad buds; the sterile globular, yellow; the fertile oval, crimson-red, being the color of the bracts. The commonest ones described here. Others are in cultivation.

L. Europæa, DC. European Larch. A fine fast-growing tree, with leaves about 1′ long, and cones 1′ long, of numerous scales. There is a weeping form.

L. Americàna, Michx. American Larch, Tamarack or Hackmatack. Swamps N.; slender tree with shorter and paler leaves, and small cones of few scales, only $\frac{1}{2}'$ or $\frac{3}{4}'$ long.

8. CRYPTOMÈRIA. (From the Greek, means *concealed parts* or *joints.*) Evergreen tree from Japan.

C. Japónica, D. Don. Often in conservatories and in the open from Long Island (sparingly), S.; leaves crowded, awl-shaped, many-ranked, edgewise and decurrent on the stem.

9. TAXÒDIUM, BALD CYPRESS. (Greek: *Yew-like;* the resemblance is only in the shape of the leaves.) Flowers before the leaves, in earliest spring.

T. dístichum, Richard. AMERICAN B. or SOUTHERN CYPRESS. Large tree in swamps, from Del., S., and planted even N.; branchlets slender, many of them falling in autumn like leafstalks; leaves light green, ½′ long, narrow-linear, 2-ranked, on some flower-bearing shoots awl-shaped and imbricated; cones 1′ or less thick.

10. SEQUÒIA, REDWOOD. (Named for the Cherokee half-breed Indian *See-qua-yah*, who invented an alphabet for his nation.) Very celebrated, gigantic, Californian trees, with fibrous bark, not unlike that of Taxodium, and soft, fissile, dull red wood. Neither species is hardy in New England, or safe in the Middle States; but the second is disposed to stand.

S. sempérvirens, Endl. COMMON REDWOOD of the coast ranges of Cal.; with flat and linear acute leaves 2-ranked on the branches, but small awl-shaped and scattered ones on the erect or leading shoots, and small globular cones (barely 1′ long).

S. gigantèa, Torr. GIANT REDWOOD (in Eng. called WELLINGTÒNIA) of the Sierra Nevada; with all the leaves awl-shaped and distributed round the branch; cones ovoid, 1½′–2′ long.

11. CUPRÉSSUS, CYPRESS. Classical name of the Oriental Cypress, namely,

C. sempérvirens, Linn. Planted only far S.; stiff narrow tree, with slender erect branches, dark foliage, and cone 1′ in diameter, each scale many-seeded.

12. CHAMÆCÝPARIS, FALSE CYPRESS. (Greek: *ground cypress.*)

* WHITE CEDAR, *with rather stiff branches and closely appressed leaves.*

C. sphræroídea, Spach. COMMON WHITE CEDAR. Tree of low grounds, from Me., S., with white valuable wood, slender spray, and pale, glaucous-green, triangular-awl-shaped leaves much finer than in Arbor Vitæ; cones hardly ½′ wide, with few seeds to each scale, and these almost wingless.

* * CYPRESSES *of cultivation, ours with drooping spray.*

C. Lawsoniàna, Parl. A most graceful species, with thickly set and plume-like, flat, pendulous spray of bluish-green hue, and cones scarcely above ¼′ in thickness, their scales bearing 2–4 ovules and ripening 2 or 3 seeds; male catkins red. N. Cal., where it reaches 100° in height. Many varieties are in cultivation. Half hardy N.

C. Nutkaénsis, Spach. (THUYÓPSIS BOREÀLIS). NOOTKA SOUND CYPRESS. Like the last, but more robust in habit, its foliage pale-green, and its male catkins sulphur-yellow. Hardier, and cult. in several forms. Ore., N.

* * * RETINÓSPORAS *of cultivation, with more erect branchlets and sometimes slightly spreading leaves. Japan.*

C. pisífera, Sieb. & Zucc. Pyramidal tree, or generally a bush as seen in cultivation, with feathery spray, slender branchlets, and distinctly 4-rowed, scale-like, somewhat distant, sharp leaves, which are brownish-green above, bearing 2 glaucous lines beneath; cones the size of small peas, with 8–12 scales which are irregularly crenulate on the margin. The forms in cultivation, as RETINÓSPORA PLUMÒSA, R. ERICOÌDES, R. SQUARRÒSA and R. FILÍFERA, are considered to be forms of this species.

C. obtûsa, Sieb. & Zucc. Distinguished from the above by its obtusish and closely appressed leaves, larger cones (½′ in diam.) which have 8 (rarely 9 or 10) cones with entire-margined scales, which, however, are furnished with a tubercle-like tip in the center. RETINÓSPORA TETRAGÒNA, R. FILICOÌDES, and R. LYCOPODIOÌDES belong here.

13. THÙJA, ARBOR VITÆ. (Ancient name of some resin-bearing evergreen.) The varieties planted in collections are very numerous; the following are the principal natural types, by some taken for genera. (Lessons, Fig. 166.)

T. occidentàlis, Linn. AMERICAN ARBOR VITÆ, or WHITE CEDAR (incorrectly) of the N. and of lumbermen. Common tree N., in swamps and cool, moist woods, much planted, especially for hedges and screens; leaves mostly of the scale-shaped sort, blunt, and adnate; cones oblong, rather soft, the oblong scales pointless, and bearing 2 thin-winged seeds. Many nursery varieties, some of which, especially var. ERICOÌDES or HEATH-LIKE A., have the loose, awl-shaped sort of leaves. SIBERIAN ARBOR VITÆ is a form of it.

T. orientâlis, Linn. (BIÒTA ORIENTÀLIS). CHINESE A. Not hardy far N.; small tree, with even the scale-shaped leaves acute; cone larger, with thicker scales tipped with a recurving, horn-like apex or appendage, each 2-seeded, and the seeds hard-shelled and wingless. Numerous forms are cultivated.

T. dolabràta, Linn. (THUYÓPSIS DOLABRÀTA). Japan. Remarkable for its very flat spray, broad and very blunt, large leaves (sometimes ¼′ long) green above and white beneath; the cone with thick and rounded scales, each with 5 wing-margined seeds.

14. JUNÍPERUS, JUNIPER. (Classical Latin name.) Flowers late spring.

* *Leaves like those of Cypress and Arbor Vitæ (both scale-like and awl-shaped, small, the former sort minute and very adnate).*

J. Virginiàna, Linn. RED CEDAR, SAVIN. A familiar shrub and small or large tree, with most durable and valuable, reddish, odorous wood; the small fruit dark with a white bloom, erect on the short supporting branchlet.

J. Sabìna, Linn., var. **procúmbens**, Pursh. Rocky banks, trailing over the ground along our northern borders, with the scale-shaped leaves less acute, and the fruit nodding on the short, peduncle-like, recurved branchlet.

J. Chinénsis, Linn. Low or medium-sized, dicœcious tree of upright habit; male plant with numerous branches, the upper ones ascending or erect, the leaves generally in 3's, stiff and spreading, green or glaucous; female plant with longer and more distant branches, the leaves shorter and more appressed and in pairs; berries dull-violet, small. China to Nepaul.

* * *Leaves all of one sort, in whorls of 3, jointed with the stem, linear with an awl-shaped, prickly point; the midrib prominent, also the rib-like margins.*

J. commùnis, Linn. COMMON JUNIPER. Erect or spreading shrub, with very sharp-pointed leaves, green below and white on the upper face; berries large and smooth. The wild, low, much spreading variety is common N. in sterile or rocky ground. Var. HIBÉRNICA, a very erect, tree-like shrub, forming a narrow column, is most planted for ornament. From Eu. Many cult. forms.

15. TÁXUS, YEW. (Classical name, from the Greek for a *bow:* the tough wood was chosen for bows.) Flowers early spring.

T. baccàta, Linn. EUROPEAN YEW. Low tree, with thick, upright trunk, spreading, short branches, and pointed, dark-green leaves about 1′ long; when planted in this country forms only a shrub. Var. FASTIGIÀTA, IRISH YEW. A singular form, making a narrow column, the branches appressed; the leaves shorter, broader, and scarcely in two ranks.

T. tardìva, Laws. (T. ADPRÉSSA). Low tree or shrub, with no distinct leader, and therefore making a flat top; leaves short, ovate-oblong, and very dark-green, 2-rowed; berries pale-pink. Said to have come from Japan, but probably only a form of T. baccata.

T. cuspidàta, Sieb. & Zucc. Small tree or hardy bush, with the habit of T. baccata, but looser; leaves broader and abruptly pointed, leathery in texture and lighter-colored, 2-ranked on the branchlets, but scattered on the older growth. Japan.

T. Canadénsis, Willd. AMERICAN Y., GROUND HEMLOCK. A straggling bush on shady banks and hills, N. J., to Minn. and N.; widely spreading on the ground; leaves green and linear, short; berries light-red.

16. TORRÈYA. (*Dr. John Torrey*, a distinguished American botanist.) Flowers in spring.

T. taxifòlia, Arn. Woods in Fla.; a handsome tree, but with the wood and foliage ill-scented; leaves like those of Yew, but longer and tapering to a sharp point; hardy as a shrub as far north as N. Y.

17. GÍNKGO, GINKGO TREE. (Japanese name.)

G. bíloba, Linn. (SALISBÙRIA ADIANTIFÒLIA). MAIDENHAIR TREE. A most singular tree, planted from China and Japan, hardy N.; branches spreading; the fan-shaped, maidenhair-like, alternate leaves with their slender stalks 3′ or 4′ long; fruit a drupe an inch or more long, with a stone like that of the plum, the meat edible. Dicœcious or monœcious.

18. PODOCÁRPUS. (Greek: *stalked fruit.*)

P. Chinénsis, Wall. A very erect shrub, like the Irish Yew not fully hardy N.; leaves linear-lanceolate, 2′–3′ long; fruit ovoid. China.

P. Nagèia, R. Br. Handsome, erect tree with slender and sometimes pendulous branches; leaves broadly ovate, attenuated at the point and slightly glaucous; fruit globose, dark-purple. Japan.

CXXXVI. CYCADACEÆ, CYCAD FAMILY.

Trees or shrubs with palm-like trunks which increase by a terminal bud; the leaves pinnate and coiled in the bud, like ferns. Flowers dicœcious, the fertile consisting of 2 ovules under scales, and arranged in cones or on the margins of contracted leaves. Only two species need be mentioned here:

Cỳcas revolùta, Thunb. (Lessons, Fig. 47.) Japan; a palm-like, low tree of conservatories, wrongly called SAGO PALM; leaves 2°–6° long, curving outwards, the pinnæ stiff, dark-green; stem commonly simple.

Zàmia integrifòlia, Willd. COONTIE of S. Fla., whose root-like trunk, which does not rise above ground, furnishes a kind of flour called FLORIDA ARROW ROOT; leaves petioled and spreading, with numerous lanceolate or linear-lanceolate pinnæ.

SERIES II.

FLOWERLESS OR CRYPTOGAMOUS PLANTS.[1]

Those which fructify without true flowers; that is, without stamens and pistils, and produce spores (simple cells) in place of seeds.

Class III. ACROGENS.

The highest class of Flowerless Plants, those with a distinct axis, or stem, growing from the apex, containing woody matter and ducts, and bearing leaves, or something answering to leaves.

CXXXVII. EQUISETACEÆ, HORSETAIL FAMILY.

Perennial plants, rising from creeping rootstocks; the stems mostly hollow, furrowed, many-jointed, with mere scales at the joints united into a sheath in place of leaves; either simple or with branches in whorls about the joints; fructification in terminal cone-like spikes, composed of 5-angled, short-stalked, and shield-shaped scales, each bearing on the under surface about 6 one-celled spore cases. Contains but one genus, Equisètum, the Horsetails or Scouring Rushes, in low places. For the species the student should consult the Manual. (Lessons, Figs. 493–498.)

CXXXVIII. FILICES, FERN FAMILY.

Plants with creeping or ascending rootstocks, or even erect trunks, bearing distinct leaves (*fronds*) on stalks (or *stipes*) which are rolled up (*circinate*) in the bud, and bear commonly

[1] The account of the Flowerless Plants in the original edition was prepared by Professor D. C. Eaton of Yale College.

on the under surface or on the edges the simple fructification, consisting of 1-celled spore cases (technically called *sporangia*) variously grouped in dots, lines, or masses (called *sori* or *fruit dots*) and containing but one kind of minute, 1-celled, powdery, numerous *spores*, which are discharged when the sporangia finally split open. A large family, most abundant in warm and moist regions.

[*The divisions of a pinnatifid frond are properly called segments; of a pinnate frond, pinnæ; of a 2-3-4-pinnate frond, pinnules or ultimate segments. The stalk of the frond is a stipe; its continuation through the frond, the rhachis; its branches, partial or secondary rhachises. A rhachis bordered by the leafy portion becomes a midrib, which may be primary, secondary, etc.*]

I. POLYPODIUM SUBFAMILY. Characterized by stalked spore cases, having a vertical, incomplete, many-jointed, elastic ring, which straightens at maturity, breaking open the spore case transversely, and so discharging the spores. Spore cases rarely if ever on very narrow thread-like branches; the fruit dots often covered by a scale-like involucre (the *indusium*).

§ 1. *No definite fruit dots, but the spore cases in large patches on the under surface of the fertile frond, or entirely covering the under surface; no indusium.*

1. ACROSTICHUM § CHRYSODIUM. Fronds simple or pinnately branched, with reticulated veins; spore cases covering the whole under surface of the frond or of its upper divisions.

2. PLATYCERIUM. Fronds irregularly forking; veins reticulated; spore cases in large patches on special portions of the under surface.

§ 2. *Spore cases on the back of the frond, sometimes near the margin, in dots or lines (sori) placed on the veins or at the ends of the veins, but without indusium of any kind.*

3. POLYPODIUM. Fronds simple or pinnate, rarely twice pinnate; veins free or reticulated; fruit dots round or roundish, at the ends of the veins, or at the point where several veins meet (*anastomose*). Stalk articulated to the rootstock, and leaving a distinct scar when decayed away.

(15. PHEGOPTERIS may be sought here.)

4. GYMNOGRAMME § CEROPTERIS. Fronds compound, more or less covered beneath with white or yellow waxy powder; fruit dots in long often forking lines on the veins.

5. NOTHOLÆNA. Fronds once or twice pinnate, woolly, scaly or powdery beneath; fruit dots at the ends of the veins, forming a line next the margin of the divisions.

§ 3. *Spore cases on the back along the margin of the frond, provided with an involucre formed of its reflexed and more or less altered margin.*

6. ADIANTUM. Fruit dots at the ends of the veins, borne on the inner side of a reflexed portion of the margin. Stalk dark and polished, sometimes chaffy-bristly. Pinnules always separate, distinctly stalked or almost sessile, but never decurrent on the rhachis.

7. PTERIS. Spore cases on a transverse, vein-like receptacle within the margin, which connects the ends of the veins, and is covered by the reflexed thin margin. Stalk light-colored (except in § Doryopteris). Pinnules or ultimate segments adnate to the rhachis, often decurrent.

8. PELLÆA. Spore cases in short lines on the upper part of the veins, confluent in a sub-marginal band of fructification, white within, more or less covered by the reflexed and commonly thin margin. Stalk dark and polished, sometimes chaffy. Pinnules mostly distinct, sessile or nearly so.

9. CHEILANTHES. Fruit dots minute and at the ends of the veins, distinct or nearly contiguous, and covered by an indusium formed of the reflexed margin of the pinnule or of its lobes. Fronds mostly hairy or chaffy, low, 2–3-pinnate, the sterile and fertile ones nearly alike.

§ 4. *Fruit dots oblong or linear, on transverse reticulating veinlets, in rows near the midrib and parallel to it; indusium of the same shape as the fruit dot, opening toward the midrib and attached by the outer edge to the fruitful cross-veinlet.*

10. WOODWARDIA. Fruit dots straight, oblong-linear, in chain-like rows, partly sunken in shallow cavities of the under surface of the frond. Rather large, native. Veins reticulated, often very much so.

11. BLECHNUM. Fruit dots linear and nearly or wholly continuous, parallel with the midrib and close to it. Indusium thin and membranaceous, distinct from the edge of the frond. Veins forked, usually free. Fronds pinnate (in ours).

§ 5. *Fruit dots oblong or linear, on one or both sides of oblique veinlets, with involucres of like shape attached by one edge to the veinlet and free along the other.*

12. ASPLENIUM. Fruit dots single and placed on the upper side of the veinlets, rarely double and set back to back on both sides of the same veinlet. Veins mostly free.

13. SCOLOPENDRIUM. Fruit dots linear, elongated, double and placed face to face along contiguous veinlets; each pair thus seeming to be a single one with an indusium opening along the middle. Frond simple, ribbon-shaped or tongue-shaped, with free forking veins.

14. CAMPTOSORUS. Fruit dots various, mostly short; those near the midrib double, as in the last; the outer ones angled, curved or straight, simple as in Asplenium. Frond simple, tapering to a long and narrow usually rooting point. Veins reticulated.

§ 6. *Fruit dots on the back of the veins, rarely at the ends, round or roundish, covered at least when young by a special indusium of the same general shape (except in No. 15). Sterile and fertile fronds alike or nearly so.*

15. PHEGOPTERIS. Agrees with Polypodium in most respects; but has the fruit dots smaller, and commonly on the free veins, not at their ends, and the stalk is not articulated to the rootstock. Indusium 0. Fronds thin, ternate or bipinnate.

16. ASPIDIUM. Indusium flat, round or kidney-shaped, fixed at or near the center, opening all round the edge. Mostly rather large Ferns, from once to thrice pinnate. Veins free in the native species.

17. CYSTOPTERIS. Indusium convex, fixed by the base partly under the fruit dot, at length reflexed. Small Ferns, with delicate twice or thrice pinnate frond. Veins free.

18. NEPHROLEPIS. Fruit dots circular, borne on the tip of the upper branch of a vein, and usually close to the margin of the frond. Indusium roundish or kidney-shaped. Forms pinnate, with the pinnæ articulated at the base, white-dotted above, the veins all free.

§ 7. *Involucres star-shaped, with broad and ragged or else capillary and jointed rays, placed on the veins under the round fruit dots, sometimes at first enveloping the spore cases.*

19. WOODSIA. Small Ferns, often growing in dense tufts; fronds once or twice pinnate; veins forked, free.

§ 8. *Sterile fronds broad and leafy; fertile ones with contracted and rolled up pod-like or berry-like divisions; indusium very obscure, irregularly semicircular, placed at the base of a short receptacle to which the spore cases are attached.*

20. ONOCLEA. Fronds scattered on a long creeping rootstock or growing in a crown; sterile ones either with reticulated or free veins; fertile ones pinnate or twice pinnate, the divisions contracted, rolled up and berry-like.

§ 9. *Fruit dots separate or laterally confluent at or near the margin of the frond, borne on the ends of the veins, or on the ends of very short side-veinlets; the indusium attached at the base or base and sides, and opening toward the margin of the fruitful portion of the frond.*

21. DAVALLIA. Indusium of a single piece, flattish or often convex and shaped like half a goblet cut lengthwise. Exotic Ferns, mostly decompound.

22. DICKSONIA. Indusium united by its sides with a little lobe or tooth of the frond, forming a minute 2-lipped cup, at first nearly or quite closed, opening as the spore cases ripen. Large Ferns, native or exotic, some of the latter arborescent.

II. CYATHEA or TREEFERN SUBFAMILY. With erect and tree-like stems, often many feet high. Fruit dots round, not marginal, naked, or with an involucre placed beneath the stalked spore cases, which are seated on a globose or elevated receptacle, have a somewhat oblique complete ring, and burst open transversely. (Lessons, Fig. 500.)

23. CYATHEA. Fruit dots on a vein or in the forking of a vein, at first inclosed in a globose involucre, which opens at the top, and remains cup-shaped with an entire or broken edge.

24. ALSOPHILA. Fruit dots as in the last, but entirely naked, or with a rudimentary indusium consisting of a minute scale beneath the spore cases; veins free.

III. HYMENOPHYLLUM or FILMY FERN SUBFAMILY. These have very delicate and translucent fronds, the short-pediceled spore cases growing on a short or long threadlike receptacle, included in a goblet-shaped or 2-lipped involucre, and furnished with a complete transverse or slightly oblique ring.

25. TRICHOMANES. Fruit dots marginal, at the end of a vein, which extends through the funnel-form or goblet-shaped involucre, as a thread-like receptacle bearing the spore cases; involucres sunken more or less in the frond, and of the same pellucid texture.

IV. SCHIZÆA SUBFAMILY. Mostly small Ferns, or else with climbing fronds. Spore cases ovate, sessile, having a complete transverse, articulated ring or cap at the apex, and opening by a longitudinal slit.

* *Ferns with elegant climbing fronds, rising from slender creeping rootstocks; spore cases fixed by their side.*

26. LYGODIUM. Pinnæ or frondlets in pairs. Spore cases covered by imbricating scale-like indusia in a double row on narrow lobes of the frond.

* * *Not climbing; rootstock short; fronds clustered; spore cases fixed by their base; no indusium.*

27. ANEIMIA. Spore cases on the narrow panicled branches of the lowest pair of pinnæ of the 1–3 pinnate frond, or on separate fronds.

28. SCHIZÆA. Spore cases in a double row on the narrow divisions of a pinnate or rarely pedate special appendage to the simple and linear, or fan-shaped, and sometimes many-forked frond.

V. OSMUNDA or FLOWERING FERN SUBFAMILY.

Rather large Ferns; the spore cases covered with reticulated ridges, opening longitudinally into two valves, and with no ring, or a mere vestige of a transverse ring at the back.

29. OSMUNDA. Rootstock very thick, creeping, the growing end producing a crown of tall showy fronds. Fertile fronds or parts of fronds contracted, pinnately compound, the narrow often thread-like divisions densely covered with nearly sessile spore cases.

1. ACRÓSTICHUM § CHRYSÒDIUM. (Greek: *a row at the top*, the application not evident.) All tropical.

A. aùreum, Linn. A large evergreen Fern, along the coast of S. Fla.; the fronds simply pinnate, coriaceous, 2°–6° long; pinnæ 4′–6′ long, 1′–2′ wide, elliptical or oblong-linear.

2. PLATYCÈRIUM, STAG-HORN FERN. (Name from the Greek, meaning *broad horns.*) Natives of Africa, Australia, etc.; cult. in conservatories.

P. alcicórne, Gaud. Sterile fronds sessile, rather thin, flat and rounded, overlapping each other; fertile ones erect, 1° high, whitish and minutely downy beneath, 2–3 times forked, with divisions about 1′ wide, the topmost ones fruitful.

3. POLYPÒDIUM, POLYPODY. (Greek: *many-footed*, referring to the branching rootstock.) An immense genus, found in all parts of the world.

§ 1. POLYPODIUM proper. *Veins free; the following native.*

P. vulgàre, Linn. COMMON POLYPODY. Rocky places N.; small, simply pinnatifid, evergreen, smooth both sides, 4′–10′ high, 1′–3′ wide, the numerous divisions oblong-linear; fruit dots rather large. (Lessons, Fig. 499.)

P. incànum, Swartz. Shady places, Va., to Ill., and S., often on trees; much like the last, but much smaller, and beneath grayish and scurfy, with peltate scales; fruit dots rather small.

§ 2. PHLEBÒDIUM. *Veins reticulated, with free veinlets included in the larger meshes. Fruit dots in 1–3 rows between the midrib and margin, commonly placed each one on the converging ends of a pair of veinlets.*

P. aùreum, Linn. A large showy Fern of Fla., and cult. from West Indies; fronds on a stout stalk, broadly ovate in outline, smooth, pale-green above, glaucous beneath, pinnately parted into 5–9 or more oblong-linear or lanceolate spreading divisions.

4. GYMNOGRÁMME § CERÓPTERIS. (Greek: a *naked line*, from the elongated fruit dots.) The following cult. species have free veins, and the under surface of the fronds covered with a yellow or whitish waxy powder.

* *Fronds small and distinctly triangular or 5-angular.*

G. triangulàris, Kaulf. CALIFORNIAN GOLD FERN. Frond 4′–6′ long, on slender and polished stalks, broadly 3- or rather 5-angled in outline, twice pinnate below, pinnate above; pinnæ oblong-lanceolate, deeply pinnatifid into obtuse lobes. Smooth and green above, beneath of a rich

golden-yellow, sometimes paler; the fertile fronds at length nearly covered with brownish lines of spore cases. Cal. to Ariz.

* * *Fronds obscurely triangular-oblong or narrower.*

+ *Twice or less pinnate.*

G. sulphùrea, Desv. West Indies; fronds narrowly lanceolate in outline, 1°–1½° high, 2′–3′ wide, pinnate; pinnæ ovate or ovate-oblong, lower ones gradually smaller and very remote, pinnatifid into ovate, obtuse toothed or ragged lobes, the lower surface covered with sulphur-yellow powder.

G. calomélanos, Kaulf. Trop. Amer., the commonest Gold and Silver Ferns of the conservatories, and variable; much like the last, but broader and larger, the lower pinnæ largest, and lobes mostly acute. The powder white, or in var. CHRYSOPHÝLLA golden-yellow.

G. tartàrea, Desv. (G. DEALBÀTA). Trop. Amer.; fronds dull green above but snowy-white-powdered below, oblong-triangular, 1°–2° long and half as broad, the dark-chestnut-brown stipes 6′–12′ long, the spear-lanceolate pinnæ largest at the base of the frond and divided into oblong, bluntish, nearly or quite entire segments. There are forms with yellow powder.

+ + *Fronds more than twice pinnate.*

G. schizophýlla, Moore. Fronds from a central crown, slightly powdered below, about 2° long and 6′ broad, on slender reddish stipes, the pinnules divided into very small ultimate segments. Delicate and graceful, often producing young plants from the fronds. Jamaica.

5. **NOTHOLÆNA** (spelled also NOTHOCHLÆNA). (Greek, signifying *spurious covering*, the woolly pubescence of some species concealing the marginal fruit dots.) The following species are small, 4′–8′ high, ovate in outline, mostly tripinnate; their ultimate divisions roundish, ovate or oblong, distinct, stalked, and covered beneath with a waxy powder; stalk and branches dark brown and polished.

N. flàvens, Moore (N. CHRYSOPHÝLLA of gardens). Central Amer.; powder bright yellow; fruit dots extending from the edge almost to the midrib, so that it might equally well be considered a Gymnogramme.

N. nívea, Desv. Very like the first, but the powder snowy-white, and the fruit dots closer to the margin; pinnules long-stalked, the segments roundish, the terminal ones largest and either entire or 3-lobed. Central Amer., to N. Mexico, etc.

N. dealbàta, Kunze. Differs from the last (of which it is probably only a variety) in its smaller segments, which are more numerous and longer than broad, the terminal ones rarely lobed. Kan. and Mo., S. W.

6. **ADIÁNTUM**, MAIDENHAIR. (Greek, meaning *unwetted*, the rain drops not adhering to the fronds.) A large genus, most abundant in warm climates.

* *Frond two-forked, with elongated simply pinnate divisions springing from the upper side of the two recurved branches; midrib of the pinnules none; veins forked from the base.*

A. pedàtum, Linn. MAIDENHAIR. In shady woods; whole plant smooth, 1°–2° high; principal divisions 4′–10′ long, 1′–1½′ wide; pinnules very numerous, oblong, broadest at the base, obtuse, lobed from the upper edge; fruit dots at the top of the lobes; involucres transversely oblong or linear.

* * *Frond 2–4 times pinnate, ovate-lanceolate or triangular in general outline.*

A. Capíllus-Véneris, Linn. VENUS'S HAIR, so named from the shining capillary branches of the rhachis; native Va. and Ky., S., often in conservatories N.; twice pinnate or thrice pinnate at the base, the long upper part simply pinnate; pinnules about ½′ broad, on very slender stalks, sharply wedge-shaped at the base, rounded at the top, or rhomboidal, commonly deeply lobed from the upper margin; fruit dots one to each lobe; involucres kidney-shaped or transversely oblong. Plant 6′–12′ high, often pendent from damp shaded rocks in the mouths of wells, etc., in S. of Eu.

A. cuneàtum, Langsd. & Fisch. S. Amer.; fronds broadly triangular in outline, 3–4 times pinnate; pinnules small and very numerous, wedge-shaped at the base, the upper edge deeply lobed; fruit dots in deep sinuses of the upper margin. A. GRACÍLLIMUM, the commonest Maidenhair of the florists, with decompound and very delicate fronds, as a garden form of this species.

A. ténerum, Swartz. Fla. and S., and cult.; fronds deltoid, 3–4-pinnate, 1°–3° long and the stipes 1° high, the pinnules cuneate and rounded or angled on the upper edge, sometimes deeply lobed, articulated to their petioles. Original of the remarkable A. FARLEYÉNSE of horticulturists (from Farley Hill, Barbadoes), which has very large fronds (2°–3° long) and very large drooping, fringed pinnules.

7. PTÈRIS, BRAKE. (The ancient Greek name for Ferns, meaning *a wing*, from the feather-like fronds.) A large and widely distributed genus.

* *Frond simply pinnate; pinnæ undivided.*

P. longifòlia, Linn. Cult. from warm regions, native in S. Fla.; oblong-lanceolate in outline; pinnæ numerous, linear and tapering from a truncate or cordate base, the upper and lower ones gradually smaller.

* * *Frond pinnate, and with the lower pairs of pinnæ forked or again pinnate, the divisions and upper pinnæ elongated, simple.*

P. Crètica, Linn. Cult. from warm climates, native in Fla.; 1°–2° high; pinnæ 1–4 pairs, the upper ones slightly decurrent, lower ones cleft almost to the base into 2–3 long, linear-lanceolate, acuminate divisions; sterile ones and tips of the narrower fertile ones finely and sharply serrate. Var. ALBO-LINEÀTA has a whitish stripe in the middle of each division.

P. serrulàta, Linn. f. Cult. from China, but native in Ga. and Ala.; 1°–1½° high; pinnæ 3–8 pairs, all but the lowest decurrent and forming a wing 3″ wide on the main rhachis; lower pairs pinnately or pedately cut into several narrow linear-acuminate divisions; upper ones simple, sterile ones spinulose-serrulate.

* * * *Fronds pinnate, and the numerous, primary divisions pinnately cut into many lobes (except sometimes the uppermost), the lowest ones mostly with 1–3 elongated, similarly-lobed branches on the lower side.*

P. quadriaurìta, Retz. Cult. from the tropics; fronds 1°–3° long, 6′–12′ wide, broadly ovate in outline; lobes of primary divisions linear-oblong, ½′–1′ long, 3″ wide, very numerous and often crowded, mostly rather obtuse. Var. ARGÝREA has a band of white along the middle of the primary divisions; to this is added a tinge of red in var. TRÍCOLOR.

P. trémula, R.Br. Australia and New Zealand; fronds 2°–4° long and mostly broad, the tip with a few, close, undivided pinnæ or lobes which are decurrent at the base, some of the upper pinnæ simply pinnate, but

the lower ones very compound and often 1° long; fruit dots very numerous, often covering nearly the whole segment.

* * * * *Fronds broadly triangular, twice or thrice pinnate throughout; lowest primary divisions long-stalked.*

P. aquilìna, Linn. COMMON BRAKE. Plentiful everywhere, 1°–5° high, harsh to the touch; the lowest primary divisions standing obliquely forward; secondary divisions pinnatifid with many oblong or linear, sometimes hastate lobes, which in a fruiting frond are bordered everywhere with brown spore cases; variable.

8. PELLÆA, CLIFF BRAKE. (Greek: *dusky,* descriptive of the stalk.) Mostly small Ferns.

P. atropurpùrea, Link. Wild, on shaded limestone; fronds tufted, 6′–12′ long, 2′–4′ wide, with polished and sparingly downy stalks, 2-pinnate, simply pinnate toward the top; pinnules distinct, oblong, or linear-oblong, rarely halberd-shaped, obtuse, or slightly mucronate; involucre rather broad, and at length hidden by the spore cases.

P. grácilis, Hook. Fronds 3′–6′ high, of very delicate texture, the pinnæ few, the lower ones being once or twice pinnately-parted; pinnæ of the fertile frond oblong or linear-oblong and entire, or nearly so; those of the sterile frond ovate or obovate and crenate or incised. Limestone rocks, Mass., W. and N.

P. ternifòlia, Fée. Fronds 6′–12′ long, lance-linear, the opposite pinnæ of 6–12 pairs, each one cleft nearly to the base into 3 linear, rigid segments with inrolled edges. Trop. Amer.

9. CHEILÁNTHES, LIP FERN. (Greek: *lip flower,* from the form of the indusium.) A few species are cultivated, not mentioned here.

* *Fronds smooth.*

C. Alabaménsis, Kunze. Fronds 2′–8′ long, ovate-lanceolate and 2-pinnate; the pinnæ numerous and oblong-lanceolate, with triangular-oblong pinnules. Mountains, Va. and Ky., S.

* * *Fronds hairy.*

C. vestìta, Swartz. Fronds 6′–15′ high, lanceolate, oblong, rusty-hairy, 2-pinnate; the pinnæ rather distant and triangular-ovate; pinnules oblong and crowded and somewhat incised with reflexed lobes. Rocks, N. Y. City, S. and W.

* * * *Fronds woolly or tomentose.*

C. tomentòsa, Link. Fronds 12′–20′ high, lance-oblong, densely whitish-tomentose, 3-pinnate; primary and secondary pinnæ oblong or ovate-oblong; pinnules distinct, the margin continuously reflexed. Mountains, Va. and Ky., S.

C. lanuginòsa, Nutt. Fronds 3′–6′ high, on dark, shining stipes, ovate-lanceolate, whitish-woolly, 2- or 3-pinnate; pinnæ ovate, the lowest distinct and the upper contiguous; pinnules crenate-pinnatifid; the margin almost continuously reflexed. Tufted; cliffs, Minn., S. and W.

10. WOODWÁRDIA, CHAIN FERN. (*Thomas J. Woodward,* an English botanist of the last century.)

W. Virgínica, Smith. Tall, growing in swamps, Me., S. and W.; sterile and fertile fronds alike, ovate in outline, pinnate, with lanceolate, deeply pinnatifid pinnæ; lobes oblong, obtuse; veins reticulated, forming a single row of meshes along the midribs of pinnæ and of lobes, the outer veinlets free; fruit dots oblong, close to the midribs.

W. angustifòlia, Smith. Fronds 6′–12′ long, 4′–6′ broad, pinnatifid almost to the winged rhachis into 17–27 lobes, which are broadly lanceolate with copiously reticulated veins in the sterile frond, but are narrowly linear in the fertile, with a single row of narrow meshes next the midrib; fruit dots linear, sausage-shaped, one in each mesh. N. Eng., S., near the coast; also on L. Mich., Ark., etc.

11. BLÉCHNUM. (Old Greek name.)

B. Brasiliénse, Desv. Trunk 2°–3° high, from the top of which arise many long, oblong-lanceolate, pinnatifid fronds, curving outwards 2°–3°; segments very numerous and leathery. Brazil and Peru.

B. occidentàle, Linn. Fronds arising from the surface of the ground, 9′–18′ long, and half as broad, pinnate; the pinnæ 6–12 opposite pairs of leathery texture and oblong and entire, with an auricled or heart-shaped base. W. Indies.

12. ASPLÈNIUM, SPLEENWORT. (Greek: refers to supposed action on the spleen.) A very large genus, the size of the species ranging from quite small up to very large and even tree-like.

§ 1. *Fronds undivided, large and showy; cult. from East Indies, etc.*

A. Nìdus, Linn. Bird's-nest Fern. Fronds numerous, broadly lanceolate, 2°–4° long, 4′–8′ wide, entire, short-stalked, arranged in a crown around the central upright rootstock; fruit dots very narrow, elongated, crowded, running from the stout midrib obliquely half way to the margin.

§ 2. *Fronds small, pinnatifid below, tapering into a long, entire point; native.*

A. pinnatífidum, Nutt. Very rare, near Philadelphia, and sparingly W. and S., especially along the Alleghanies; fronds 3′–6′ long, ½′–1¼′ wide at the base; lobes roundish-ovate, mostly obtuse; fruit dots small, irregular.

§ 3. *Fronds simply pinnate.*

* *Small ferns, 4′–15′ high.*

A. Trichómanes, Linn. Common, forming dense tufts in crevices of shady rocks; fronds linear, 4′–8′ long, with black and shining stalk and rhachis, and many roundish or oblong, slightly crenated or entire pinnæ, about ¼′ long and about half as broad; fruit dots few to each pinna.

A. ebèneum, Ait. Frequent in rocky woods; fronds linear-lanceolate, narrower at the base, 8′–15′ long, 1′–2′ wide; stalk dark and polished; pinnæ many, linear-oblong, often slightly curved, finely serrate, auricled on one or both sides at the base; fruit dots numerous.

A. flabellifòlium, Cav. Cult. from Australia; lax, the rhachis often prolonged and rooting at the very end; fronds linear; pinnæ sharply wedged-shaped at the base, the broad and rounded end crenated; fruit dots irregularly radiating from the base of the pinnæ.

* * *Large ferns, 1°–3° high.*

A. angustifòlium, Michx. Rich woods, N., and S. mainly along the mountains; fronds thin, long-lanceolate; pinnæ many, 3′–4′ long, linear-lanceolate from a truncate or rounded base, acuminate, nearly entire; those of the fertile frond narrower; fruit dots slightly curved, very numerous.

§ 4. *Fronds more than once pinnate.*

* *Fruit dots more than one in each smallest division of the frond.*

A. Rùta-murària, Linn. Wall Rue. On exposed cliffs of limestone, from Vt., W. and S.; fronds small, 1′–4′ long, ovate, twice or thrice pin-

nate, the few divisions rather thickish, wedge-shaped or rhomboid, toothed at the top; fruit dots few, becoming confluent.

A. furcàtum, Thunb. Cult. from Trop. Amer., S. Africa, etc.; fronds 8′–15′ long, 3′–6′ wide, on a somewhat hairy stalk, ovate-lanceolate, pinnate with lance-oblong, acuminate pinnæ, which are again pinnately cut nearly or quite to the midrib; divisions oblique, wedged-shaped, narrow, serrate, rather coriaceous, deeply marked by the forking veins; fruit dots elongated, radiating from the base of the division.

A. thelypteroìdes, Michx. In rich, rocky woods, not rare; fronds 1½°–3° high, thin in texture, broadly lanceolate, pinnate; pinnæ 3′–6′ long, lanceolate, deeply pinnatifid into close-set, oblong, and obtuse, minutely toothed lobes; fruit dots 6–12 to each lobe, some of them commonly double.

A. Fìlix-fœmina, Bernh. Lady Fern. Common in moist woods; fronds large (2°–3° high, 4′–8′ broad), growing like the last in a crown, 2–3-pinnate; pinnæ lanceolate, with a narrow border to the secondary rhachis; pinnules oblong and sharply serrate, or in larger plants lanceolate and pinnatifid with incised lobes; fruit dots short, variously curved, at length confluent.

* * *Smallest divisions of the frond narrow, entire, containing but a single veinlet and but one fruit dot.*

A. Belàngeri, Kunze. Cult. from Malacca and Java; fronds 1°–1½° high, 2′–3′ wide, coriaceous, pale green, as is the stoutish stalk; pinnæ oblong, truncate at the base, with a rounded apex, pinnatifid to the winged midrib into numerous narrowly oblong and obtuse lobes, the upper basal ones of each pinna 2–3-cleft, the rest entire and bearing on the side farthest from the main rhachis a solitary elongated fruit dot.

A. bulbìferum, Forst. Cult. from New Zealand, etc.; fronds herbaceous, ample, broadly lanceolate, 1°–3° long, 6′–12′ wide, 2–3-pinnate, often producing leafy bulbs on the upper surface; pinnæ triangular-lanceolate, with a broadly winged midrib; pinnules lanceolate, deeply toothed or cut into oblong-linear lobes; fruit dots extending from the middle of the lobes downward almost to the midrib of the pinnules.

13. SCOLOPÉNDRIUM. (Name from the Greek word for a *centipede*, suggested by the many oblique lines of fruit each side of the midrib.)

S. vulgàre, Smith. Hart's-tongue. Rare, among shaded rocks in Central New York, in Canada West and in Tenn.; fronds 6′–18′ long, 1′–2′ wide, oblong-lanceolate from a heart-shaped base, herbaceous, the margin entire or wavy. Cultivated forms from England are crisped, crested, many-forked, etc.

14. CAMPTOSÒRUS, WALKING LEAF. (Greek: meaning a *bent fruit dot.*)

C. rhizophýllus, Link. Damp, mossy rocks, N., and S. mainly along the mountains; frond evergreen, 4′–12′ long, tapering from a heart-shaped or auricled base 6″–12″ wide to a long, narrow point, which often roots at the end, and there gives rise to a new plant, ready to take another step in advance. (Lessons, Fig. 501.)

15. PHEGÓPTERIS, BEECH FERN (which the name means in Greek, the original species often found among beeches). Chiefly tropical, but the following are all wild species, in rocky or shady woods.

* *Fronds twice pinnatifid; the sessile pinnæ mostly forming an irregular and many-angled wing along the rhachis.*

P. polypodioìdes, Fée. Common N.; fronds 4′–9′ long, longer than broad, triangular-ovate, slightly hairy beneath; pinnæ lanceolate, the

lower pair turned obliquely forwards; secondary divisions crowded, oblong, obtuse, entire; fruit dots all near the margin.

P. hexagonóptera, Fée. Common N. and S.; larger than the last, which it much resembles, but the frond is broader than long; lowest pinnæ much the largest and with elongated and pinnatifid divisions; fruit dots not exclusively near the margin.

* * *Fronds with three primary divisions, which are stalked; rhachis wingless.*

P. Dryópteris, Fée. Common N.; fronds broadly triangular, 4′–6′ wide, smooth; the three primary divisions triangular, once or twice pinnate with oblong, obtuse, entire, or toothed lobes; fruit dots near the margin.

16. ASPÍDIUM, SHIELD FERN. (Greek for a *little shield*, referring to the indusium.) A very large genus, inhabiting all parts of the world. (Lessons, Figs. 502–504.)

§ 1. Nephròdium or Dryópteris. *Indusium round-kidney-shaped or nearly circular, with a narrow cleft from the lower side almost to the center.*

* *Fronds thin, decaying in early autumn (or tender hot house plants), pinnate; pinnæ simply pinnatifid, with mostly entire, obtuse lobes; indusium small.*

+ *Rootstock creeping, slender, nearly naked, and bearing scattered fronds; veins free, simple, or once forked; common in bogs and low grounds.*

A. Thelýpteris, Swartz. Fronds lanceolate, 10′–18′ long, on slender stalks, nearly smooth; pinnæ lanceolate, 2′–4′ long, about ½′ wide, spreading or turned down, the lowest pair scarcely shorter; divisions oblong, fruiting ones seeming acute from the revolute margins; veins mostly forked; fruit dots confluent when ripe; indusium smooth; N. and S.

A. Noveboracénse, Swartz. Much like the last, but hairy beneath along the rhachis and veins; fronds tapering both ways from the middle; lower pinnæ gradually smaller and distant; lobes flat, the basal ones often larger and incised; veins rarely forked; fruit dots distinct; indusium slightly glandular. N. Car., N. and W.; common N.

+ + *Rootstock oblique or erect, stouter, bearing the fronds in a crown; veins simple, free, or the lower ones of contiguous lobes united; indusium hairy.*

A. pàtens, Swartz. Low, shady grounds, Fla. and W.; fronds 1°–2° high, sparsely pubescent, ovate-oblong; pinnæ 3′–6′ long, ½′ wide, numerous, lanceolate from a broad base, lowest pairs a little smaller; divisions oblong, slightly falcate, obtuse, or acutish; veins entirely free; indusium slightly hairy.

* * *Fronds smooth, from once to thrice pinnate, growing in a crown from a stout and chaffy rootstock, and often remaining green through the winter; veins 2–4-forked or branching. Wild species of the country.*

+ *Fronds imperfectly evergreen, once-pinnate with deeply pinnatifid pinnæ, or nearly twice pinnate; fruit dots not close to the margin; indusium rather large, flat, smooth, persistent.*

A. Goldiànum, Hook. Rich, moist woods, Conn., to Ky., and N.; fronds broadly ovate, 2°–4° high, 9′–12′ wide; pinnæ oblong-lanceolate, broadest about the middle, parted to the midrib; divisions very numerous, nearly 1′ long, somewhat scythe-shaped, rather acute, serrate with incurved teeth; fruit dots very near the midvein.

A. cristàtum, Swartz. Wet places in woods, frequent; fronds narrowly oblong, 1°–2° high, 3′–5′ wide, rather rigid, erect; pinnæ triangular-ovate, broadest at base, pinnatifid almost to the midrib, divisions not many, oblong, obtuse, finely serrate, the largest ones sometimes toothed or pinnatifid-lobed; fruit dots half way between midvein and margin.

Var. **Clintoniànum**, Eaton. In swampy woods, N., is very much larger every way, with fruit dots nearer the midvein, and is often mistaken for A. Goldianum.

A. Floridànum, Eaton. Wet woods, Fla.; lower pinnæ triangular-lanceolate and sterile, but the upper ones fertile, narrower, and longer, with very short, obtuse, rather distant divisions, which are decurrent on the winged, secondary rhachis.

+– +– Fronds imperfectly evergreen, twice or thrice pinnate; the divisions cut-toothed or incised; fruit dots not near the margin; indusium rather small, withering away.

A. spinulòsum, Swartz. Shady woods, very common N.; fronds thin, oblong-ovate; pinnæ oblong-lanceolate, the lower ones broader and somewhat triangular; pinnules very numerous, oblong-ovate, pinnately incised; the oblong lobes with spinulose teeth toward the ends; indusium smooth or minutely glandular at the margin. Has several forms.

Var. **dilatàtum**, Hook. In mountainous places and cool woods, N. Eng. to Minn., and N., is larger, broader in outline and oftenest 3-pinnate; pinnules lance-oblong, the lowest greatly elongated; indusium smooth and naked.

A. Boóttii, Tuckm. Swampy woods N.; 2°–3° high, of narrow outline, barely twice pinnate, with oblong-ovate toothed pinnules, or the lower ones pinnatifid; indusium minutely glandular; sterile fronds smaller and simpler than the fertile ones.

+– +– +– Fronds fully evergreen, thickish, about twice-pinnate; fruit dots near the margin; indusium thickish, convex, persistent.

A. marginàle, Swartz. Rocky woods, common N.; fronds 1°–2° long, ovate-oblong, bluish-green, the stalk very chaffy; pinnæ lanceolate, 3′–5′ long; pinnules oblong, often curved, entire, or obtusely toothed, attached by a broad base to the narrowly winged, secondary rhachis; fruit dots close to the margin, rather large.

§ 2. Polýstichum. *Indusium orbicular, peltate, attached by the center to a short stalk; veins forking, free.*

A. acrostichoìdes, Swartz. Christmas Fern. Fronds 1°–2° high, growing in crowns, with chaffy rootstocks and stalks, evergreen, shining, lanceolate, simply pinnate; pinnæ numerous, oblong-lanceolate from an unequal half-halberd-shaped base, serrulate with bristle-pointed teeth, rarely incised, upper ones of the fertile frond smaller and bearing copious, soon confluent fruit dots. Common in woods; often used in Christmas decorations.

§ 3. Cyrtòmium. *Indusium as in* § Polystichum. *Fronds once pinnate; veins pinnate from the midrib, pinnately branching; the veinlets reticulated and forming arched meshes with 1–3 free included veinlets rising from the base of the arch.*

A. falcàtum, Swartz. Cult. from Japan, China, etc., and very variable; fronds 1°–2° high, 5′–9′ broad; base of stalk chaffy with large scales; pinnæ thick and shining, end one large and rhomboid or halberd-shaped; side ones few or many, oblong-ovate, long-pointed, nearly entire, lower side of base rounded, upper side angled or slightly auricled; fruit dots in many rows on all or nearly all the pinnæ.

17. **CYSTÓPTERIS.** (Greek for *bladder fern*, alluding to the thin, sometimes inflated indusium.) Species few, mostly northern.

C. frágilis, Bernh. Shaded or moist, rocky places, common N.; fronds very delicate, 4′–8′ long, with slender stalks, oblong-ovate, twice-pinnate; pinnæ with a narrowly margined rhachis; pinnules oblong or ovate, toothed or incised, very variable; indusium pointed at the upper end.

C. bulbífera, Bernh. Wet places, oftenest in ravines, from N. Car., N.; fronds 1°–3° high, 3′–5′ wide at the base, narrowed above and much elongated, twice pinnate, bearing scattered bulblets beneath; pinnules oblong, obtuse, toothed or pinnatifid; indusium roundish, truncate on the upper side.

18. **NEPHRÓLEPIS.** (Greek: *kidney*, *scale*, referring to the shape of the indusium.)

N. exaltàta, Schott. Fla. and the tropics, and one of the commonest ferns of conservatories; fronds 1°–6° long and very narrow; the pinnæ crowded, lanceolate, entire or slightly crenulate, the upper side auricled at the base; indusium kidney-shaped.

N. davallioìdes, Kunze. Popular conservatory fern from E. Indies, with a stoloniferous base; and pinnate fronds 2°–4° long and 1° broad, on rather short, strong stipes; pinnæ 4′–6′ long and ½′–1′ broad, lanceolate, the lower ones opposite and sterile and serrate, the upper ones fertile and longer and narrower, more deeply toothed. A common form is var. FÚRCANS, in which the ends of the upper pinnæ, and often of the frond itself, are deeply 2–∞-forked.

19. **WOÓDSIA.** (For *Joseph Woods*, an English botanist.) Several species occur in our limits, the following being the commonest.

W. obtùsa, Torr. Rocky places, from Car., N.; fronds 6′–18′ high, slightly glandular, broadly lanceolate, pinnate, with ovate or oblong, deeply pinnatifid or again pinnate divisions; lobes oblong, obtuse; indusium at first closed, opening into a few ragged lobes.

W. Ilvénsis, R.Br. Exposed rocks, common N., and along the Alleghanies; forms large tufts; fronds 4′–8′ high, rusty chaffy beneath, oblong-lanceolate, pinnate; divisions ovate, obtusely lobed; indusium obscure, consisting of a few jointed hairs.

20. **ONOCLÈA** (including STRUTHIÓPTERIS), SENSITIVE FERN. (Name, from the Greek, meaning a *closed vessel*, referring to the berry-like fructification.)

O. sensíbilis, Linn. BRAKE. Common in wet places, and often a weed in hilly pastures; sterile fronds of all sizes up to 2° high, broadly triangular-ovate, the rhachis winged; pinnæ not many, lanceolate, entire, or obtusely lobed less than half way to the midrib, veins everywhere reticulated; fertile fronds with few, closely appressed pinnæ.

O. Struthiópteris, Hoffm. OSTRICH FERN. Alluvial grounds, N.; sterile fronds tall, 2°–5° high, lanceolate, narrowed at the base into a short, angular stalk, pinnate; pinnæ very many, narrowly lanceolate, pinnatifid more than half way to the midrib; lobes numerous, oblong; fertile fronds very much shorter, blackish, standing erect after the others have withered.

21. **DAVÁLLIA.** (Named for *M. Davall*, a Swiss botanist.) Many tropical or sub-tropical species, many cult. in conservatories.

D. Canariénsis, Smith. HARE'S-FOOT FERN. Canary Islands, etc.; rootstock creeping above ground, covered with brownish scales, and

looking not unlike an animal's paw; fronds few, smooth, broadly triangular, 8′–15′ long and about as wide, 3–4-pinnate; pinnules cut into a few narrow lobes; these are directed upwards, bearing at or just below the end a single fruit dot; indusium whitish, deeply half-cup-shaped.

D. tenuifòlia, Swartz. India and China; rootstock creeping, crisp with short, chaffy hairs; fronds smooth, 1°–2° high, broadly lanceolate, 3–4-pinnate; smallest divisions narrowly wedge-shaped, bearing at the truncated ends one or two fruit dots; indusium brownish, mostly broader than deep.

22. **DICKSÒNIA.** (For *James Dickson*, an English botanist.) The species all but one tropical or in the southern hemisphere. Many of them tree-like.

D. pilosiúscula, Willd. Moist shady places, from N. Car., N.; rootstock creeping, slender; fronds scattered, thin, minutely glandular, pleasantly odorous, lanceolate, long-pointed, 2°–3° high, mostly bipinnate; pinnules pinnatifid; the divisions toothed, each bearing a minute fruit dot at the upper margin; indusium globular.

D. antárctica, Labill. Tree fern from New Zealand, a great ornament in large conservatories; trunk 1°–2° thick, sometimes many feet high, bearing in a crown at the top many fronds, 6°–9° long, 2°–4° broad, coriaceous, twice pinnate; pinnules oblong, acute, pinnatifid; the oblong-ovate divisions bearing 1–4 rather large fruit dots; indusium prominent, plainly two-valved.

23. **CYÁTHEA.** (Name from the Greek word for a *small cup*, referring to the involucre.) Tree ferns from tropical countries.

C. dealbàta, Swartz. New Zealand, and the commonest one in cultivation; trunk becoming 10°–15° high; fronds from the elevated crown, 5°–7° long, glaucous-green above and whitish beneath, 2- or 3-pinnate, ovate-lanceolate or tapering from the base; ultimate segments sickle-shaped and conspicuously toothed.

24. **ALSÓPHILA.** (Greek words meaning *grove-loving*, the species growing in tropical forests.)

A. pruinàta, Kaulf. S. Amer.; trunk low; rootstock short, clothed with bright brown wool; fronds smooth, green above, pale and glaucous, often almost white beneath, bipinnate; pinnules deeply toothed; fruit dots solitary at the base of each tooth; spore cases mixed with woolly hairs.

A. austràlis, Brown. The commonest species, from Tasmania and Australia; trunk becoming 8°–15° high, bearing a flat and spreading crown of many 2–3-pinnate fronds 8°–20° long and with stipes 1°–2° long, light green above and bluish below; pinnæ 1°–2° long and 6′–12′ broad; ultimate segments oblong-acute and somewhat falcate, serrate; rhachis rough and chaffy; entire foliage thick and leathery.

25. **TRICHÓMANES.** (An ancient Greek name of some Fern, referring to the hair-like stalks.) A large genus; most of the species tropical.

T. radìcans, Swartz. On dripping rocks, Ky., and S., rare; fronds pellucid, 4′–8′ high, the stalk and rhachis narrowly winged, lanceolate, pinnate, with 1–2-pinnatifid ovate pinnæ; involucres on short lobes, funnel-shaped, with long-exserted receptacles. A broader and more compound form is grown in Wardian cases.

26. LYGÒDIUM, CLIMBING FERN. (Name from a Greek word, meaning *flexible*, alluding to the twining and climbing fronds.) Not many species; several species are cult. in choice collections.

L. palmàtum, Swartz. HARTFORD FERN. Low shady woods, local or rare; smooth, slender, and delicate, 2°–4° high, entangled among herbs; pinnæ roundish, 12″–18″ wide, deeply heart-shaped at the base, palmately 5–7-lobed, upper ones decompound and fertile.

L. Japónicum, Swartz. Conservatory plant from Japan; climbing 10°–12° high, smooth; pinnæ ovate, 5′–9′ long, bipinnate, divisions ovate-lanceolate, often halberd-shaped; divisions of the upper pinnæ bordered with narrow fertile lobes.

27. ANEÌMIA. (Greek, meaning *without covering*, alluding to the naked spore cases; by others said to mean *bloodless*.) Mainly tropical.

A. Phyllítidis, Swartz. Cult. from S. Amer.; 12′–18′ high; has the two lower pinnæ long-stalked, narrowly elongated, 3–4-pinnate, fertile; middle portion of the frond sterile, simply pinnate; pinnæ lanceolate, finely serrate; veins reticulated.

A. adiantoides, Swartz. S. Fla., and cult.; with lower pinnæ as in the last; middle portion sterile, 2–3-pinnate; pinnæ long-pointed; divisions obovate-wedge-shaped, entire or toothed at the end, with free veins forking from the base.

28. SCHIZÆA. (Name from the Greek verb which means *to split*, referring to the many-forked fronds of certain tropical species.)

S. pusílla, Pursh. Wet sand, in pine woods of N. J. (also Nova Scotia and Newfoundland); sterile fronds very slender, flattened, simple and linear, curled up; fertile ones similar, but straight, 2′–3′ high, bearing at the top the fertile portion, 2″–3″ long, composed of about 5 pairs of minute pinnæ. (Lessons, Figs. 505–507.)

29. OSMÚNDA, FLOWERING FERN. (*Osmundr*, Saxon name of Thor, the Celtic divinity.) Species very few, fruiting in spring or early summer.

* *Fertile pinnæ at the top of the frond, like a panicle.*

O. regàlis, Linn. ROYAL FERN. Common in swamps and wet woods, fruiting later than the others; fronds truly bipinnate; pinnules oval or oblong, serrulate, obtuse, sometimes a little heart-shaped at base, or slightly auricled on one side; spore cases light brown.

* * *Fertile pinnæ in the middle or near the base of the leafy frond.*

O. Claytoniàna, Linn. Wet places, common; sterile fronds much like those of the next, but more obtuse at the top; fertile ones with 2–4 pairs of contracted and fertile blackish pinnæ just below the middle, but otherwise like the sterile.

* * * *Fertile pinnæ on distinct not leafy fronds.*

O. cinnamòmea, Linn. CINNAMON FERN. Swamps, common; sterile fronds 2°–5° high, broadly lanceolate, pinnate with many lanceolate, deeply pinnatifid pinnæ; fertile ones much shorter, at first woolly, soon withering; fructification bright cinnamon color.

CXXXIX. OPHIOGLOSSACEÆ, ADDER'S TONGUE FERN FAMILY.

Mostly rather small ferns, with sessile, globular, coriaceous, opaque, and smooth spore cases in spikes or panicles, opening transversely into 2 valves, and wholly destitute of a ring. Fronds not rolled up in the bud, as they are in the true Ferns, rising from a very short rootstock or corm, with fleshy roots. Plants often somewhat fleshy. (Lessons, Fig. 508.)

1. BOTRYCHIUM. Spore cases in pinnate or compound spikes, distinct. Sterile part of the frond compound; veins free.
2. OPHIOGLOSSUM. Spore cases cohering in a simple spike. Sterile part of frond simple in our species; the veins reticulated.

1. BOTRÝCHIUM, MOONWORT. (From Greek, for a *bunch of grapes*, from the appearance of the fructification.) Species few, none cultivated. Several inconspicuous ones occur on our northern borders.

B. ternàtum, Swartz. Shaded grassy pastures and hillsides; plant fleshy, 3′–10′ high; common stalk with two branches, a long-stalked, fertile one with twice or thrice pinnate fructification facing a triangular ternately compound sterile portion on a longer or shorter stalk; has several forms, of which the following are mostly well marked. Var. **lunarioìdes** has roundish, kidney-shaped, sterile divisions; in var. **oblìquum** they are lanceolate from an oblique base; and in var. **disséctum**, pinnatifid into narrowly toothed and ragged lobes.

B. Virgínicum, Swartz. In rich woods; plant herbaceous, not fleshy, 6′–18′ high; sterile portion sessile on the common stalk, thin, broadly triangular, ternate; the parts twice or thrice pinnate; divisions thin, oblong-lanceolate, incised or toothed; fertile portion long-stalked, twice or thrice pinnate.

2. OPHIOGLÓSSUM, ADDER'S TONGUE. (Greek equivalent of the common name.)

O. vulgàtum, Linn. Wet meadows or hillside pastures, rare; 3′–10′ high; sterile portion somewhat fleshy, ovate or elliptical, entire, 1′–2′ long, sessile near the middle of the stalk which supports the short two-sided spike. (Lessons, Fig. 508.)

CXL. LYCOPODIACEÆ, CLUB MOSS FAMILY.

Flowerless plants, often moss-like or fern-like, with leafy, often elongated and branching stems, the spores contained in rather large solitary 1–3-celled spore cases borne in the axils of the simple mostly awl-shaped leaves (fruiting leaves often reduced to scales forming a sort of spike). (Lessons, Figs. 511, 512.) Mostly evergreen plants, growing on land; stems more or less elongated and branching; the leaves awl-shaped,

in 4 or more rows, less than 1′ long, the 2-valved kidney-shaped spore cases all of one kind, containing only minute numberless spores.

1. **LYCOPÒDIUM**, CLUB MOSS. (Name from the Greek, meaning *wolf's-foot*, possibly from the short hairy branches of *L. clavatum*.)

§ 1. *Fructification not in a distinct spike. Leaves all alike, dark green, rigid, in about 8 rows.*

L. lucídulum, Michx. Stems 4′–8′ long, tufted, ascending, forking; leaves spreading or reflexed, sharp-pointed, irregularly serrulate, dark green and shining. Cold woods N.

§ 2. *Fructification spiked at the top of an erect branch; fertile leaves and those of the creeping stems nearly alike, soft, narrowly linear, many-rowed.*

L. inundàtum, Linn. Dwarf, the sterile stems creeping and forking, the fertile solitary and 1′–4′ high, with a short, thick spike; leaves lanceolate or awl-like and acute, mostly entire, soft. Bogs N.; uncommon.

L. alopecuroìdes, Linn. Pine barren swamps, N. J., and S.; scarcely evergreen; stem and sparingly forked sterile branches creeping, fertile ones 6′–18′ high, all rather stout and thickly clothed with spreading, soft, linear-awl-shaped, bristly-ciliate leaves, those of the spike with long slender tips.

§ 3. *Fructification spiked; the fruiting leaves yellowish, scale-like, shorter and broader than those of the sterile branches.*

* *Spike sessile at the top of an ordinary branch.*

L. annótinum, Linn. Cold woods N.; stem creeping, 1°–4° long; branches 4′–9′ high, nearly erect, once or twice forked; leaves about 5-rowed, spreading or reflexed, rigid, lanceolate, acute, nearly entire; those of the solitary spikes ovate, with spreading points and ragged scarious margins.

L. obscùrum, Linn. GROUND PINE. Moist woods, common N.; rootstock creeping underground, nearly leafless; stems looking much like a miniature hemlock, 9′–12′ high; the many spreading branches with shining, lanceolate, entire leaves in about 6 rows; leaves of the lower and often of the upper row smaller than the rest; spikes single, or 4–10 on a plant; scales ovate pointed, margin slightly scarious, nearly entire.

* * *Spikes raised above the ordinary branches on a slender stalk which has only a few inconspicuous leaves.*

+ *Stems creeping, very short; spikes always single.*

L. Carolinièanum, Linn. Wet pine barrens, N. J., S.; scarcely evergreen; stem and prostrate branches rooting underneath; leaves soft, lanceolate, entire, spreading horizontally, with an upper appressed row; spikes slender on stalks 4′–6′ high; allied in habit to L. alopecuroides.

+ + *Stems extensively creeping; spikes often in pairs or fours.*

L. clavàtum, Linn. CLUB MOSS. Common N. in dry woods; running stem long and leafy; branches mostly erect, cordlike, irregularly pinnate; branchlets 4–10, thickly covered with linear-awl-shaped, entire, commonly bristle-tipped leaves; spikes mostly in pairs. Much used for Christmas decorations.

L. complanàtum, Linn. Dry sandy woods, commonest among evergreens; running stems with scattered, awl-shaped, very small leaves; branches erect, several times branched; the parts repeatedly forked into many horizontally spreading flattened branchlets.

CXLI. SELAGINELLACEÆ, SELAGINELLA FAMILY.

Low, moss-like, often creeping plants, with scale-like leaves (mostly 4-rowed, the alternate rows often of smaller leaves), differing from the last family chiefly in having 1-celled spore cases which contain two kinds of spores (the nature of which need not be explained here). (Lessons, Figs. 513–515.) One genus:

1. SELAGINÉLLA. (Name a diminutive of *Selago*, a species of Lycopodium.) Species over 200, the greater part tropical.

§ 1. *Native species.*

S. rupéstris, Spring. Exposed rocks; a common moss-like little evergreen; stems and densely tufted branches 1′–2′ high; leaves awl-shaped, marked with a narrow furrow on the back, and tipped with a minute bristly point; spikes four-cornered.

S. àpus, Spring. Damp places in meadows; common, especially S.; very delicate; stems 2′–4′ high, sparingly branched; leaves 4-rowed, those of the side rows spreading horizontally, scarcely 1″ long, ovate with the upper side larger, minutely serrulate; intermediate ones half as large, erect, very acute; spikes 2″–6″ long. Often cult. as S. densa.

§ 2. *Cultivated, mostly tropical species, seen in conservatories; much branched; leaves of the branches four-rowed, two side rows of spreading leaves set apparently edgewise, and two upper rows of smaller appressed leaves. Spike four-cornered, at the ends of the branchlets.*

* *Stems trailing, sending out rootlets nearly up to the end.*

S. Kraussiàna, A.Br. (LYCOPÒDIUM DENTICULÀTUM of the florists.) The commonest conservatory species, used for edgings, etc.; stems very long, articulated beneath each branch; branches distant, bearing a few short forked branchlets, which are 2″–3″ broad, their leaves closely placed in each row; leaves bright green, the larger ones oblong-ovate, acute, rounded on the upper side, nearly straight on the lower, minutely denticulate; smaller ones with longer often reflexed points.

* * *Stems ascending, only the lower part bearing long rootlets.*

S. Marténsii, Spring. (LYCOPÒDIUM STOLONÍFERUM of florists). Stems 6′–10′ long, much branched from the base; branches bipinnate, with copious branchlets 2″–3″ or even 4″ wide; larger leaves crowded, obliquely ovate, the upper side broadest, obtuse, entire; smaller ones ovate, with a slender often recurved point.

* * * *Stems erect, or nearly so, rooting only at the very base.*

S. erýpthropus, Spring. Stalk 2′–6′ high, bright red, having a few closely appressed red leaves, and bearing at the top a broad frond-like stem pinnately or pedately divided into a few 2–3 times pinnate branches, with very numerous extremely crowded branchlets 1″–1½″ wide; leaves closely imbricated, obliquely ovate-oblong, curved upward, rather obtuse, ciliate; smaller ones ovate, with long straight points.

* * * * *Stems in a dense, nest-like tuft, not rooting; branches often curling up when dry.*

S. lepidophýlla, Spring. BIRD'S-NEST MOSS, RESURRECTION PLANT. It is a nest-like ball when dry, but when moist it unfolds and displays the densely 2–3-pinnate, elegant, fern-like branches radiating from a coiled-up central stem; the leaves white-margined, closely imbricated, round-ovate, obtuse. Texas, W. and S.

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